



Project Manual

For

Science Lab Modernization Walnut Grove Intermediate School

614 East Vine Avenue
West Covina, CA 91790

VOLUME 1

Bidding and Contract Requirements
And Specifications

for the

West Covina Unified School District
1717 West Merced Avenue
West Covina, CA 91790

Date: February 21, 2023

PBK Project No.: 220117
DSA Application No.: 03-123048



IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT

APP: 03-123048 INC:

REVIEWED FOR

SS FLS ACS

DATE: 10/05/2023

Project Manual

for:

Science Lab Modernization Walnut Grove Intermediate School

for the

West Covina Unified School District

Date: February 21, 2023

PBK Project No.: 220117

Consultants:

Architect:

PBK
8163 Rochester Avenue
Rancho Cucamonga, CA 91730
Phone (909) 987-0909



Mechanical:

LEAF Engineers
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Electrical:

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Plumbing:

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Fire Alarm/Technology

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SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Phased construction.
 - 4. Work by Owner.
 - 5. Work under separate contracts.
 - 6. Future Work.
 - 7. Purchase contracts.
 - 8. Owner furnished products.
 - 9. Owner furnished, Contractor installed products.
 - 10. Access to site.
 - 11. Coordination with occupants.
 - 12. Work restrictions.
 - 13. Specification and drawing conventions.
 - 14. Miscellaneous provisions.

1.3 PROJECT INFORMATION

- A. Project Identification:
 - 1. Project Location:
614 E Vine Ave.
West Covina, CA 91790
- B. Owner:
 - 1. Owner's Representative:
West Covina Unified School District
Jose Gomez – Director of Facilities
- C. Architect: PBK Architects, Rancho Cucamonga, California.
- D. Consultants: Additional design professionals have been retained who have prepared designated portions of the Contract Documents.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following: Modernization of 3 Science Classrooms and student restrooms in Building 7. Modernization includes, but is not limited to additional student sinks, teacher demonstration table with sink, Electrical, Technology and voice evacuation systems per CBC 907 new finishes. Accessibility upgrades to student restrooms and replacing drinking fountain with new high-low with bottle filling station. Path of travel upgrades to visitor parking, accessibility upgrades in gender neutral restrooms in the Administration Building. Replacing drinking fountain with new high-low with bottle filling station and (2) additional bottle filling stations in MPR Building.
- B. Type of Contract: Design/Bid/ Build.

1.5 WORK BY OWNER AND UNDER SEPARATE CONTRACTS

- A. Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying the work or work by Owner. Coordinate the work with work performed by Owner.
- B. The Owner reserves the right to let separate contract for work outside of the scope of this Contract. 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.
- C. Purchase Contracts: The Owner reserves the right to negotiate purchase contracts with suppliers of material and equipment that may be incorporated into the work. The Owner will assign these purchase contracts to Contractor. Include costs for purchasing, receiving, handling, storage if required, and installation of material and equipment in the Contract Sum, unless otherwise indicated.
 - 1. Contractor's responsibilities are same as if Contractor had negotiated purchase contracts, including responsibility to renegotiate purchase and to execute final purchasing agreements.
- D. Owner Furnished Products (OFCI): The Owner will furnish products indicated. The work includes receiving, unloading, handling, storing, protecting, and installing Owner furnished products and making building services connections when applicable.
 - 1. Owner Furnished Products: Coordinate with Owner.

1.6 ACCESS TO SITE

- A. Use of Site: Limit use of Project site to Work in areas and areas within the Contract limits indicated. Do not disturb portions of site beyond areas in which the Work is indicated.
 - 1. Limits: The drawings indicate the limits of the construction operations.
 - 2. Driveways, Walkways, and Entrances: Keep driveways. parking areas, student drop off and pick up points, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, the students, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in weathertight condition throughout construction period. Repair damage caused by construction operations.

1.7 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform Work to prevent interference with Owner's day to day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.
- B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
 - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
 - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
 - 3. Before limited Owner occupancy, ensure mechanical and electrical systems are fully operational, and required tests and inspections and start up procedures are successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
 - 4. Upon occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.8 WORK RESTRICTIONS

- A. Work Restrictions: Comply with restrictions on construction operations. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On Site Work Hours: Limit Work in the existing building to normal working hours, Monday through Friday, unless otherwise indicated. Coordinate with Owner when it is necessary to extend working hours or Work on weekends.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and after providing temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two weeks in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Owner not less than two weeks in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Controlled Substances, Firearms, and Explosive Devices: Use of tobacco products, controlled substances, firearms, and explosive devices on the site is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on site. Require personnel to use identification tags at all times.
- G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 1 General Requirements: Requirements of Sections in Division 1 apply to the Work of each specification section.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 CONSTRUCTION SCHEDULE

- A. The Owner has a critical need for the work to begin upon Notice to Proceed and shall be Substantially Complete by **date to be determined. There will be No Extensions of Time due to weather or holidays.**

END OF SECTION 01 10 00

SECTION 01 21 00 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include
 - 1. Lump sum allowances.
 - 2. Unit cost allowances.
 - 3. Quantity allowances.
 - 4. Contingency allowances.
 - 5. Testing and inspecting allowances.

1.3 COORDINATION

- A. Coordinate allowance items with other portions of the Work.

1.4 LUMP SUM, UNIT COST, AND QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.5 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Contractor's related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.

- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.6 TESTING AND INSPECTING ALLOWANCES

- A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.
- C. Costs of services not required by the Contract Documents are not included in the allowance.
- D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.7 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 - 3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit cost allowances.
 - 4. Owner reserves the right to establish the quantity of Work in place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
 - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
 - 2. No change to Contractor's indirect expense is permitted for selection of higher or lower priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related Work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No.1 Description
 - 1. This allowance includes \$20,000.00 lump sum for Info Graphics such as banners and large format digital images.

END OF SECTION 01 21 00

SECTION 01 25 00 SUBSTITUTION PROCEDURES AND FORM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for substitutions.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporation in the Work, regardless if specifically purchased for the Project or taken from Contractor's previously purchased stock. The term *product* is inclusive for material, equipment, assembly, system, and other terms of similar intent.
- B. Substitutions:
 - 1. Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor:
 - a. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - b. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 SUBMITTALS

- A. Substitution Requests:
 - 1. Submit three (3) copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles:
 - a. Substitution Request Form: Use facsimile of form provided in Project manual.
 - b. Documentation:
 - 1) Show compliance with requirements for substitutions and the following, as applicable:
 - a) Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b) Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, which are necessary to accommodate proposed substitution.
 - c) Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d) Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e) Samples, where applicable or requested.

- f) Certificates and qualification data, where applicable or requested.
 - g) List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i) Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j) Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k) Cost information, including a proposal of change, if any, in the Contract Sum.
 - l) Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m) Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
2. Architect's Action:
- a. If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later:
 - 1) Forms of acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - 2) Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.
- B. Coordination: Revise or adjust affected Work as necessary to integrate Work of the approved substitutions.

PART 2 PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions: Substitutions are considered as changes to the Drawings and shall be submitted to DSA.
- B. Substitutions for Cause:
 1. Submit requests for substitution immediately on discovery of need for change, but not later than 30 days prior to time required for preparation and review of related submittals:
 - a. Conditions:
 - 1) Architect will consider Contractor's request for substitution when the following

conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

- a) Requested substitution is consistent with the Contract Documents and will produce indicated results.
- b) Substitution request is fully documented and properly submitted.
- c) Requested substitution will not adversely affect Contractor's Construction Schedule.
- d) Requested substitution has received necessary approvals of authorities having jurisdiction.
- e) Requested substitution is compatible with other portions of the Work.
- f) Requested substitution has been coordinated with other portions of the Work.
- g) Requested substitution provides specified warranty.
- h) If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

C. Substitutions for Convenience:

1. Architect will consider requests for substitution if received prior to the Award of the Contract. Requests received after that time may be considered or rejected at discretion of Architect:

a. Conditions:

- 1) Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a) Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b) Requested substitution does not require extensive revisions to the Contract Documents.
 - c) Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d) Substitution request is fully documented and properly submitted.
 - e) Requested substitution will not adversely affect Contractor's Construction Schedule.
 - f) Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g) Requested substitution is compatible with other portions of the Work.
 - h) Requested substitution has been coordinated with other portions of the Work.
 - i) Requested substitution provides specified warranty.
 - j) If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 EXECUTION (NOT USED)

REQUEST FOR SUBSTITUTION

Contract Award Date:

To:

Substitution Requested By:

Project Name and Number:

We submit for consideration the following product in lieu of the specified item for the above Project:

Drawing No.	Specification Section	Paragraph	Specified Item
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Proposed Substitution:

Request is made during ____ bidding ____ construction period.

Submit in accordance with Section 01 33 00: Submittal Procedures.

1. Technical data, cost, and time information relating to changes to Construction Documents required by proposed substitution.
2. Detailed comparison of proposed substitution and specified product including but not limited to warranty, significant variations, qualifications of manufacturers, and maintenance.
3. Complete technical data, detailed shop drawings, samples, installation procedures, warranty, and substantiating data marked to indicate equivalent quality and performance to that specified. Manufacturer sell sheets are not acceptable submittals.

Cause for Request:

Cost saving realized by Owner:

Does substitution affect adjacent Work, Construction Documents, cost, schedule, quality, and related submittals?

Yes ____ No ____ On separate sheet, explain affects to the Work, documents, schedule, and submittals.

Contractor is responsible for associated costs and additional time of the proposed substitution including costs incurred by the Architect for evaluation of substitution and changes to the documents. Describe costs for changes to design, including engineering and detailing costs caused by the requested substitution.

Warranty: Is the warranty for the requested substitution the same or different? Yes ____ No ____

Explain Differences:

Contractor Certification:

In making a request for substitution, Contractor certifies that:

1. The proposed substitution has been thoroughly researched and evaluated and determined as equivalent or superior to specified product or material, will fit into space provided, and is compatible with adjacent materials.
2. It will provide the same or better warranty for the proposed substitution at no additional cost to the Owner.
3. Cost data is complete and includes related costs under the Contract. Claims for additional costs related to the proposed substitution that may subsequently become apparent are waived.
4. It will assume the responsibility for delays and costs caused by the proposed substitution, if approved, are accepted by Contractor unless delays are and costs are specifically mentioned and approved in writing by the Owner and the Architect.
5. It will assume the liability for the performance of the substitution and its performance.
6. The installation of the proposed substitution is coordinated with the Work and with changes required for the Work.
7. It will reimburse the Owner and Architect for evaluation and redesign services associated with the substitution request and, when required, by approval by governing authorities.

____ Has the substituted manufacturer/product been installed on previous PBK projects?_

If so, list project(s): (List projects within the last two years)

1. _____

District: _____

Contact: _____

2. _____

District _____

Contact: _____

Submitted by:

Signature of Contractor		Title
Firm	Telephone	Date

Signature shall be by the individual authorized to legally bind Contractor to the above terms. Failure to provide legally binding signature will result in retraction of approval.

FOR USE BY ARCHITECT:

Accepted Accepted as Noted
 Not Accepted Received Too Late

FOR USE BY OWNER:

Accepted Not Accepted

By: _____

By: _____

Date: _____

By: _____

Remarks: _____

Remarks: _____

END OF SECTION 01 25 00

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Administrative and procedural requirements for handling and processing Contract modifications.

1.3 RELATED WORK

- A. Section 01 25 00 – Substitution Procedures.

1.4 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710 *Architect's Supplemental Instructions*.

1.5 PROPOSAL REQUESTS

- A. Owner Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop Work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 1. Include statement outlining reasons for the change and the effect of the change on the Work. Provide complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.

5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 25 00 if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use AIA Document G709.

1.6 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: When an allowance is specified, refer to Section 01 21 00 for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
1. Allowance Adjustment: To adjust allowance amounts, base each Change Proposal Request (CPR) on the difference between purchase amount and the allowance, multiplied by final measurement of Work in place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - a. Include installation costs in purchase amount only where indicated as part of the allowance.
 - b. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 - c. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit cost allowances.
 - d. Owner reserves the right to establish the quantity of Work in place by independent quantity survey, measure, or count.
 2. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 7 days of receipt of the Change Order authorizing work to proceed. Owner will reject claims submitted later than 7 days after authorization.
- B. Unit Price Adjustment: When a unit price is required, refer to Section 01 22 00 for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit price Work.

1.7 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.8 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. Construction Change Directive contains a complete description of change in the Work and designates the method to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of Work required by the Construction Change Directive. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS

Not Used,

PBK Architects
Project No. 220117

Science Classroom Modernization - Walnut Grove Intermediate School
West Covina Unified School District

PART 3 - EXECUTION
Not Used

END OF SECTION 01 26 00

SECTION 01 29 00 PAYMENT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

- A. Pencil Copy: A copy submitted prior to a final/official.
- B. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination:
 - 1. Coordinate preparation of the schedule of values with preparation of Contractor's Construction Schedule:
 - a. Coordinate line items in the schedule of values with administrative forms and schedules, including the following:
 - 1) Application for Payment forms with continuation sheets.
 - 2) Updated submittal schedule.
 - 3) Items required to be indicated as separate activities in updated Contractor's Construction Schedule.
 - b. Submit the schedule of values to Architect at earliest possible date, but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment. Contractor's standard form or electronic media printout will be considered but must be approved by Owner.
- B. Format and Content:
 - 1. Use Project manual table of contents as a guide to establish line items for the schedule of values. Provide at least one (1) line item for each Specification Section:
 - a. Identification:
 - 1) Include the following Project identification on the schedule of values:
 - a) Project name and location.
 - b) Name of Architect.
 - c) Architect's Project number.
 - d) Contractor's name and address.
 - e) Date of submittal.
 - 2. Arrange schedule of values consistent with format of AIA Documents G702/G703.
 - 3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of Subcontractor.

- d. Name of manufacturer or fabricator.
- e. Name of supplier.
- f. Change Orders (numbers) that affect value.
- g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent (.01%), adjusted to total 100 percent:
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment rentals.
 - 4) General Conditions:
 - a) Supervisor.
 - b) Submittals.
 - c) Closeout.
 - d) Field Engineering.
 - e) Daily Clean-up.
 - f) Final Clean-up.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed:
 - a. Differentiate between items stored on site and items stored off site. Include evidence of insurance.
6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line item value of unit cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item:
 - a. Temporary facilities and other major cost items that are not direct cost of actual Work in place may be shown either as separate line items in the schedule of values or distributed as general overhead expense.
8. Schedule updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATION FOR PAYMENT

- A. Submit preliminary (pencil) copy of proposed values to PBK Construction Field Representative and Owner for review by the 20th of the month. Allow four (4) days for comments. Schedule review of the pencil copy during bi-monthly site visits.
- B. Once preliminary (pencil) approved, submit four (4) notarized originals of each application on AIA Form G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702 or other similar form approved by Owner.
- C. Content and Format: Utilize schedule of values for listing items in Application for Payment.
- D. Submit updated construction or recovery schedule with each Application for Payment.
- E. Payment Period: Submit at intervals stipulated in Owner/Contractor Agreement. Include Supplementary Conditions of the Contract.
- F. Only materials stored on the Project site shall be paid for unless the materials are stored in a bonded warehouse agreed upon by Owner. Periodic review of stored item will be required by the inspector of record.

- G. Substantiating Data:
1. When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Items that may be requested by Architect or Owner to substantiate costs include, but are not limited to the following:
 - a. Current Record Documents as specified in Section 01 77 00: Closeout Procedures.
 - b. Labor time sheets, purchase orders, or similar documentation.
 - c. Affidavits attesting to products stored off-site.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 29 00

SECTION 01 31 00 PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - a. General coordination procedures.
 - b. Coordination drawings.
 - c. Pre-installation meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Contractor shall make a reasonable attempt to interpret the Contract Documents before asking the Architect for assistance in interpretation. Requests for Information (RFI) will not be allowed from Sub-Contractors. The Contractor is to evaluate the Sub-Contractor's request and respond if the Contractor deems necessary the RFI will be forwarded to the Architect for a evaluation and response. The Contractor shall arrange the necessary meeting in the field with appropriate Architect's field representative(s) to obtain clarification as needed on items that may need interpretation, clarification and respond appropriately.

1.3 SUBMITTALS

- A. Subcontract List:
 - 1. 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:
 - a. Name, address, and telephone number of entity performing subcontract or supplying products.
 - b. Number and title of related Specification Section(s) covered by subcontract.
 - c. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names:
 - 1. Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and the duties and responsibilities; list address, telephone numbers (home, office, and cellular), and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project:
 - a. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.4 COORDINATION PROCEDURES

- A. Coordinate construction operations 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. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include items as required notices, reports, and list of attendees at meetings:
1. Prepare similar memoranda for Owner and separate contractors if coordination of the Work is required.
- C. Administrative Procedures:
1. Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Administrative activities include, but are not limited to, the following:
 - a. Preparation of Contractor's Construction Schedule.
 - b. Preparation of the schedule of values.
 - c. Installation and removal of temporary facilities and controls.
 - d. Delivery and processing of submittals.
 - e. Progress meetings.
 - f. Pre-installation conferences.
 - g. Project closeout activities.
 - h. Startup and adjustment of systems.
 - i. Coordinating inspections and other jurisdictional requirements.
 - j. Coordinate OFCI equipment.
 - k. Action items and issue logs.
- D. Conservation:
1. 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:
 - a. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to the Specifications Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General:
1. Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on shop drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity:
 - a. Content:
 - 1) Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a) Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b) Coordinate the addition of trade specific information to the coordination drawings by multiple contractors in sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.

- c) Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d) Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e) Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f) Indicate required installation sequences.
 - g) Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization:
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. Plenum space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures, ductwork, piping, 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 (32 mm) in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 - e. Floor boxes.
 8. Fire protection system - Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, sprinkler heads, and inspector test locations.
 9. IDF/MDF rooms: Communications and low voltage (security, data, phone, etc.) audio.
 10. Review: Architect will review coordination drawings to confirm that 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 changes as directed and resubmit.
 11. Coordination drawing prints: Prepare coordination drawing prints according to

requirements in Section 01 33 00: Submittal Procedures.

- C. Coordination Digital Data Files:
1. Prepare coordination digital data files according to the following requirements:
 - a. File preparation format: Same digital data software program, version, and operating system as original Drawings.
 - b. File submittal format: Submit or post coordination drawing files using same format as file preparation.
 - c. BIM file incorporation:
 - 1) Develop and incorporate coordination drawing files into Building Information Model established for Project:
 - a) Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
 - d. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files:
 - 1) Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - 2) Digital data software program: Drawings are available in Revit.
 - 3) Contractor shall execute a data licensing agreement in the form of AIA Document C106.

1.6 PROJECT MEETINGS

- A. Schedule and conduct meetings and conferences at Project site unless otherwise indicated:
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Architect to prepare the meeting agenda and 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.
 4. Action items: An element of work, design, research, or other task to be completed before a specific date or time, such as before a subsequent meeting of involved parties.
 5. Issue logs: Documentation element of software project management and contains a list of ongoing and closed issues of the Project.
- B. Kick-off and Preconstruction Conference:
1. Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect:
 - a. Conduct the conference to review responsibilities and personnel assignments.
 - b. 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 the Project and authorized to conclude matters relating to the Work.
 - c. Agenda: Discuss items of significance that affect progress.
 - d. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
 - e. Action items: An element of work, design, research, or other task to be completed before a specific date or time, such as before a subsequent meeting of involved parties.

- C. Pre-Installation Conferences:
1. Conduct a pre-installation trade conference at site before each construction activity that requires coordination with other construction trades:
 - a. 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 Architect and Engineer of Record of scheduled meeting dates.
 - b. Agenda: Contractor to review progress of other construction activities and preparations for the particular activity under consideration.
 - c. Contractor to record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - d. Reporting: Contractor to distribute minutes of the meeting to each party present and to other parties requiring information.
 - e. 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.
 - f. Action items: An element of work, design, research, or other task to be completed before a specific date or time, such as before a subsequent meeting of involved parties.
- D. Project Closeout Conference:
1. 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:
 - a. Conduct the conference to review requirements and responsibilities related to Substantial Completion.
 - b. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.
 - c. Agenda: Discuss items of significance that could affect or delay Project closeout.
 - d. Minutes: Entity conducting meeting will record and distribute meeting minutes.
 - e. Action items: An element of work, design, research, or other task to be completed before a specific date or time, such as before a subsequent meeting of involved parties.
- E. Progress Meetings:
1. Conduct progress meetings at weekly intervals:
 - a. Coordinate dates of meetings with preparation of payment requests.
 - b. 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 the Project and authorized to conclude matters relating to the Work.
 - c. Agenda:
 - 1) 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 the 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.

- d. Minutes:
 - 1) 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.
 - b) Six (6) week look-ahead schedules. This may be altered to three (3) week look-ahead as part of an action item when Architect/District request:
 - i. Action items: An element of work, design, research, or other task to be completed before a specific date or time, such as before a subsequent meeting of involved parties.
- F. Coordination Meetings:
 - 1. Conduct coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences:
 - a. 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 meetings shall be familiar with the Project and authorized to conclude matters relating to the Work.
 - b. Agenda:
 - 1) 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 the 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.
 - c. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
 - d. Action items: An element of work, design, research, or other task to be completed before a specific date or time, such as before a subsequent meeting of involved parties.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 31 00

SECTION 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 1. Startup construction schedule.
 2. Contractor's Construction Schedule.
 3. Construction schedule updating reports.
 4. Daily construction reports.
 5. Material location reports.
 6. Site condition reports.
 7. Special reports.

1.3 DEFINITIONS

- A. Activity:
 1. 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:
 - a. Critical activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - b. Predecessor activity: An activity that precedes another activity in the network.
 - c. Successor activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Float:
 1. The measure of leeway in starting and completing an activity:
 - a. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - b. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - c. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- F. Look-ahead Schedule: Schedule indicating activities scheduled to occur or commence prior

to submittal of next schedule update.

- G. Milestones: Measurable, observable, and serve as progress markers (flags) but, by definition, are independent of time (have zero durations); therefore, no Work or consumption of resources is associated with them.
- H. Recovery Schedule: Submittal of a revised CPM schedule and a written plan.
- I. Resource Loading: The allocation of manpower and equipment necessary for completion of an activity as scheduled.

1.4 SUBMITTALS

- A. Submittal Format:
 - 1. Submit required submittals in the following format:
 - a. Working electronic copy of schedule file, where indicated.
 - b. PDF electronic file.
- B. Startup Diagram: Of size necessary to display entire network for entire construction period. Show logic relationship ties for all activities.
- C. Contractor's Construction Schedule:
 - 1. Initial schedule, of size required to display entire schedule for entire construction period:
 - a. Submit a working electronic copy of schedule labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- D. CPM Reports:
 - 1. Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days:
 - a. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
 - b. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - c. Total Float Report: List of all activities sorted in ascending order of total float.
 - d. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.
- E. Construction Schedule Updating Reports: Submit with Applications for Payment.
- F. Daily Construction Reports: Submit at monthly intervals.
- G. Material Location Reports: Submit at monthly intervals.
- H. Site Condition Reports: Submit at time of discovery of differing conditions.
- I. Special Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

- A. Pre-Scheduling Conference:
 - 1. Conduct conference at site. Review methods and procedures related to the preliminary

construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:

- a. Review software limitations and content and format for reports.
 - b. Verify availability of qualified personnel needed to develop and update schedule.
 - c. Discuss constraints, including phasing, Work stages, area separations, interim milestones, and partial Owner occupancy.
 - d. Review delivery dates for Owner furnished products.
 - e. Review schedule for work of Owner's separate contracts, if any.
 - f. Review submittal requirements and procedures.
 - g. Review time required for review of submittals and resubmittals.
 - h. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - i. Review time required for Project closeout and Owner startup procedures.
 - j. Review and finalize list of construction activities to be included in schedule.
 - k. Review procedures for updating schedule.
- B. Coordination:
1. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports:
 - a. Secure time commitments for performing critical elements of the Work from entities involved.
 - b. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Time is of the essence to Owner. Commence Work immediately upon issuance of the Notice to Proceed. There is a critical need for the Work to be substantially complete within the time frame identified in the Agreement.
- B. Time Frame:
1. Extend schedule from date established for commencement of the Work to date of Substantial Completion and date of final completion:
 - a. Contract completion date shall not be changed by submission of schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities:
1. Treat each separate area or story as a separate numbered activity for each main element of the Work. Comply with the following:
 - a. Activity duration: Define activities in terms of number of days anticipated.
 - b. Procurement activities: Include procurement process activities for long lead items and major items requiring a cycle of more than 60 days as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - c. Submittal review time: Include review and resubmittal times indicated in Section 01 33 00: Submittal Procedures in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 - d. Startup and testing time: Include number of days anticipated for startup and testing.
 - e. Substantial Completion: Indicate completion of all conditions as in advance of date

- established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- f. Punch list and final completion: Include a maximum of 30 days for completion of punch list items and final completion.
 - g. Inspections required by Authorities Having Jurisdiction (AHJ).
- D. Constraints:
1. Include constraints and Work restrictions indicated in the Contract Documents and show how the sequence of the Work is affected:
 - a. Work restrictions:
 - 1) Show the effect of the following items on the schedule:
 - a) Coordination with existing construction.
 - b) Limitations of continued occupancies.
 - c) Uninterruptible services.
 - d) Partial occupancy before Substantial Completion.
 - e) Use of premises restrictions.
 - f) Provisions for future construction.
 - g) Seasonal variations.
 - h) Environmental control.
 - i) Rain days as indicated in Section 01 10 00: Summary.
 - b. Work stages:
 - 1) Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a) Submittals.
 - b) Mockups.
 - c) Fabrication.
 - d) Installation.
 - e) Tests and inspections.
 - f) Adjusting.
 - g) Curing.
 - E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
 - F. Six (6) Week Look-Ahead Schedule:
 1. Prepare schedule indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - a. Unresolved issues.
 - b. Unanswered Requests for Information.
 - c. Rejected or unreturned submittals.
 - d. Notations on returned submittals.
 - e. Pending modifications affecting the Work and Contract Time.
 - f. Inspections by AHJ.
 - g. Trade pre-installation conference.
 - G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
 - H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 - I. Contract Modifications: For each proposed Contract modification and concurrent with its

submission, prepare a time impact analysis to demonstrate the effect of the proposed change on the overall Project schedule.

- J. Schedule Updating:
1. Concurrent with making revisions to the schedule, prepare tabulated reports showing the following:
 - a. Identification of activities that have changed.
 - b. Changes in early and late start dates.
 - c. Changes in early and late finish dates.
 - d. Changes in activity durations in workdays.
 - e. Changes in the critical path.
 - f. Changes in total float or slack time.
 - g. Changes in Contract Time.

3.2 REPORTS

- A. Daily Construction Reports:
1. Prepare a daily construction report recording information concerning events at the site and submit each month to Architect:
 - a. List of subcontractors at the Project site.
 - b. List of separate contractors at the Project site.
 - c. Approximate count of personnel at the Project site.
 - d. Rental equipment at the Project site.
 - e. Material deliveries.
 - f. High and low temperatures and general weather conditions, including presence of rain or snow.
 - g. Accidents.
 - h. Meetings and significant decisions.
 - i. Unusual events (see special reports).
 - j. Stoppages, delays, shortages, and losses.
 - k. Meter readings and similar recordings.
 - l. Emergency procedures.
 - m. Orders and requests of AHJ.
 - n. Change Orders received and implemented.
 - o. Construction Change Directives received and implemented.
 - p. Services connected and disconnected.
 - q. Equipment or system tests and startups.
 - r. Partial completions and occupancies.
 - s. Substantial Completions authorized.
- B. Material Location Reports:
1. At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from the Project site. Indicate the following categories for stored materials:
 - a. Material stored prior to previous report and remaining in storage.
 - b. Material stored prior to previous report and since removed from storage and installed.
 - c. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report and contact Architect's field representative. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents to Architect's field representative.

- D. Special Reports:
1. Submit special reports directly to Owner within 24 hours of an occurrence. Distribute copies of report to parties affected by the occurrence:
 - a. Reporting unusual events: When an event of an unusual and significant nature occurs at site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, and response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner and Architect in advance when these events are known or predictable.

3.3 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating:
1. At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule with a pencil copy of pay application:
 - a. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - b. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - c. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution:
1. Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and interested parties identified by Contractor with a need-to-know schedule responsibility:
 - a. Post copies in Project meeting rooms and temporary field offices.
 - b. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 1. Preconstruction photographs.
 2. Periodic construction photographs.
 3. Final completion construction photographs.

1.3 SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph or video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
 1. Digital Camera: Minimum sensor resolution of 8 megapixels.
 2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
 3. Identification: Provide the following information with each image description in file metadata tag:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - g. Unique sequential identifier keyed to accompanying key plan.

1.4 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.5 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.

- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image editing software.
 - 1. Date and Time: Include date and time in file name for each image.
 - 2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

- C. Preconstruction Photographs: Before commencement of the work, take photographs of site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
 - 1. Flag construction limits before taking construction photographs.
 - 2. Take minimum of 20 photographs to show existing conditions adjacent to property before starting the work.
 - 3. Take minimum of 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

- D. Periodic Construction Photographs: Take minimum of 20 photographs monthly, coinciding with cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

- E. Architect Directed Construction Photographs: From time to time, Architect will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

- F. Time Lapse Sequence Construction Photographs: Take minimum of 20 photographs as indicated, to show status of construction and progress since last photographs were taken.
 - 1. Frequency: Take photographs monthly, coinciding with the cutoff date associated with each Application for Payment.
 - 2. Vantage Points: Following suggestions by Architect and Contractor, photographer to select vantage points. During each of the following construction phases, take not less than two of the required shots from same vantage point each time to create a time lapse sequence.
 - a. Commencement of the work, through completion of subgrade construction.
 - b. Above grade structural framing.
 - c. Exterior building enclosure.
 - d. Interior work, through date of Substantial Completion.

- G. Final Completion Construction Photographs: Take minimum of 20 color photographs after date of Substantial Completion for submission as project record documents. Architect will inform photographer of desired vantage points.
 - 1. Do not include date stamp.

- H. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.
1. Three days' notice will be given, where feasible.
 2. In emergency situations, take additional photographs within 24 hours of request.
 3. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Special events planned at Project site.
 - b. Immediate follow up when on site events result in construction damage or losses.
 - c. Take photographs at fabrication locations away from site.
 - d. Substantial Completion of a major phase or component of the work.
 - e. Extra record photographs at time of final acceptance.
 - f. Owner's request for special publicity photographs.

END OF SECTION 01 32 33

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.3 DEFINITIONS

- A. Submittals: Written and graphic information and physical samples that require Architect's responsive action or are for information and do not require the architect's action.
- B. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- C. Portable Document Format (PDF): An open standard file format used for representing documents in a device independent and display resolution independent fixed layout document format.

1.4 SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
 - 1. Upon request, Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in Revit.
 - c. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.

- d. The following digital data files will be furnished for each appropriate discipline:
 - 1) Floor plans.
 - 2) Reflected ceiling plans.

- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Processing Time: Allow time for submittal review, including time for resubmittals. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file:
 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 4. Transmittal Form for Electronic Submittals: Use software generated form from electronic project management software acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.

- k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively.
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
- a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
- 1. Submit electronic submittals via email as PDF electronic files.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Certificates and Certifications Submittals: Provide statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in PDF electronic file.
- C. Shop Drawings: Prepare Project specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full size drawings, submit Shop Drawings on sheets size indicated in specification section.
 3. Submit Shop Drawings in PDF electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples: Submit full size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
 5. Submit product schedule in PDF electronic file.

- F. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00.

- G. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00.

- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00.

- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 45 23.

- J. Closeout Submittals required for Substantial Completion: Comply with requirements specified in Section 01 77 00.

- K. Maintenance Data: Comply with requirements specified in Section 01 78 23.

- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

- B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

- B. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

- C. Incomplete submittals are not permitted, will be considered nonresponsive, and will be returned for resubmittal without review.

- D. Submittals not required by the Contract Documents will be returned by the Architect without action.

END OF SECTION 01 33 00

SECTION 01 35 16 - ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Special procedures for alteration work.

1.3 DEFINITIONS

- A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
- B. Consolidate: To strengthen loose or deteriorated materials in place.
- C. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.
- D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- H. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- I. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- J. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- K. Retain: To keep existing items that are not to be removed or dismantled.
- L. Strip: To remove existing finish down to base material unless otherwise indicated.

1.4 COORDINATION

- A. Alteration Work Subschedule: A construction schedule coordinating the sequencing and scheduling of alteration work for entire Project, including each activity to be performed, and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration work.
 - 1. Schedule construction operations in sequence required to obtain best Work results.
 - 2. Coordinate sequence of alteration work activities to accommodate the following:
 - a. Owner's continuing occupancy of portions of existing building.
 - b. Owner's partial occupancy of completed work.
 - c. Other known work in progress.
 - d. Tests and inspections.
 - 3. Detail sequence of alteration work, with start and end dates.
 - 4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
 - 5. Use of elevator and stairs.
 - 6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel base dimension data for mobile and heavy equipment proposed for use in existing structure. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.
- B. Pedestrian and Vehicular Circulation: Coordinate alteration work with circulation patterns within Project building(s) and site. Some work is near circulation patterns and adjacent to restricted areas. Circulation patterns cannot be closed off entirely and in places can be only temporarily redirected around small areas of work. Access to restricted areas may not be obstructed. Plan and execute the work accordingly.

1.5 PROJECT MEETINGS FOR ALTERATION WORK

- A. Preliminary Conference for Alteration Work: Before commencing alteration work, conduct conference at site.
- B. Coordination Meetings: Conduct coordination meetings specifically for alteration work at regular intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 - 1. Review items of significance that affect progress of alteration work.
 - a. Interface requirements of alteration work with other Project work.
 - b. Status of submittals for alteration work.
 - c. Access to alteration work locations.
 - d. Effectiveness of fire prevention plan.
 - e. Quality and work standards of alteration work.
 - f. Change Orders for alteration work.
 - 2. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.
 - 1. Carefully dismantle and salvage each item or object in a manner to prevent damage and protect it from damage, then promptly deliver it to Owner where directed.

- B. Alteration Work Subschedule: Submit alteration work subschedule within seven days of date established for commencement of alteration work.
- C. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements that are to remain, including finish surfaces, that might be misconstrued as damage caused by Contractor's alteration work operations.
- D. Alteration Work Program: Submit 30 days before work begins.
- E. Fire Prevention Plan: Submit 30 days before work begins.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Building Code: Comply with the CBC for alternation work.
 - 2. Fire Prevention Plan: Prepare a written plan for preventing fires during the work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire control devices during each phase or process. Coordinate plan with Owner's fire protection equipment and requirements. Include fire watch personnel's training, duties, and authority to enforce fire safety.
 - 3. Safety and Health Standard: Comply with ANSI/ASSE A10.6.
 - 4. Title X Requirement: Each firm conducting activities that disturb painted surfaces shall be a *Lead-Safe Certified Firm* according to 40 CFR 745, Subpart E, and use only workers that are trained in lead safe work practices.
 - 5. Accessibility Requirements: Comply with applicable requirements.
 - a. Americans with Disabilities Act of 1990, as amended.
 - 1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design
 - b. CBC 2016 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA).
 - 1) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
- B. Specialist Qualifications: An experienced firm having minimum 10 years documented experience that is regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work specified.
 - 1. Field Supervisor Qualifications: Full time supervisors experienced in specialty work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on site when specialty work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.
 - a. Construct new mockups of required work whenever a supervisor is replaced.
- C. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole Project alteration work program with specific requirements of programs required in other alteration work Sections.
 - 1. Dust and Noise Control: Include locations of proposed temporary dust and noise control partitions and means of egress from occupied areas coordinated with continuing on site operations and other known work in progress.
 - 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.

1.8 STORAGE AND HANDLING OF SALVAGED MATERIALS

- A. Salvaged Materials:
 - 1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
 - 2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.

- B. Salvaged Materials for Reinstallation:
 - 1. Repair and clean items for reuse as indicated.
 - 2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.

- C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.

- D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
 - 1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
 - 2. Secure stored materials to protect from theft.
 - 3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 degrees F (3 degrees C) or more above the dew point.

- E. Storage Space:
 - 1. Owner will arrange for limited on site location(s) for free storage of salvaged material. Storage space does not include security and climate control for stored material.
 - 2. Arrange for off site locations for storage, protection, and insurance coverage of salvaged material that cannot be stored and protected on site.

1.9 FIELD CONDITIONS

- A. Survey of Existing Conditions: Record existing conditions that affect the work by use of measured drawings, preconstruction photographs and preconstruction videotapes.
 - 1. Comply with requirements specified in Section 01 32 33.

- B. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.

- C. Owner's Removals: Before beginning alteration work, verify in correspondence with Owner that the following items have been removed:

- D. Size Limitations in Existing Spaces: Materials, products, and equipment used for performing the work and for transporting debris, materials, and products shall be of sizes that clear surfaces within existing spaces, areas, rooms, and openings, including temporary protection, by 12 inches (300 mm) or more.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.
1. Use proven protection methods, appropriate to each area and surface being protected.
 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
 3. Erect temporary barriers to form and maintain fire egress routes.
 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
 5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
 7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
 8. Provide supplemental sound control treatment to isolate demolition work from other areas of the building.
- B. Temporary Protection of Materials to Remain:
1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
 2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
- D. Utility and Communications Services:
1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
 2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
 3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.
- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.

2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

F. Existing Roofing: Prior to the start of work in an area, install roofing protection.

3.2 PROTECTION FROM FIRE

- A. Follow fire prevention plan and the following:
1. Comply with NFPA 241 requirements unless otherwise indicated.
 2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
 - a. If combustible material cannot be removed, provide fire blankets to cover materials.
- B. Heat Generating Equipment and Combustible Materials: Comply with procedures while performing work with heat generating equipment or combustible materials, including welding, torch cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
1. Obtain Owner's approval for operations involving use of open flame or welding or other high heat equipment. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
 2. As far as practicable, restrict heat generating equipment to shop areas or outside the building.
 3. Do not perform work with heat generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
 4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
 5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
 6. Fire Watch: Before working with heat generating equipment or combustible materials, station personnel to serve as a fire watch at each location where work is performed. Firewatch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
 - a. Train each fire watch in the proper operation of fire control equipment and alarms.
 - b. Prohibit firewatch personnel from other work that would be a distraction from firewatch duties.
 - c. Cease work with heat generating equipment whenever fire watch personnel are not present.
 - d. Have fire watch personnel perform final fire safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
 - e. Maintain fire watch personnel at each area of site until 60 minutes after conclusion of daily work.
- C. Fire Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.
- D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
- D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.
- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 ALTERATION WORK

- A. Have specialty work performed only by qualified specialists.
- B. Ensure that supervisory personnel are present when work begins and during its progress.
- C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs or video recordings. Comply with requirements in Section 01 32 33.
- D. Perform surveys of site as the Work progresses to detect hazards resulting from alterations.
- E. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
 - 1. Do not proceed with the work in question until directed by Architect.

END OF SECTION 01 35 16

SECTION 01 35 46 INDOOR AIR QUALITY PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Construction procedures to promote adequate indoor air quality after construction.
 - 2. Testing indoor air quality after completion of construction.
- B. Related Sections:
 - 1. Section 01 60 00: Product Requirements.
- C. Reference Standards:
 - 1. ASHRAE Std 52.2 – Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
 - 2. ASHRAE Std 62.1 – Ventilation For Acceptable Indoor Air Quality.
 - 3. ASHRAE Std 129 – Measuring Air-Change Effectiveness.
 - 4. ASTM E779 – Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
 - 5. SMACNA (OCC) – IAQ Guideline for Occupied Buildings Under Construction.
- D. Project Goals:
 - 1. Dust and airborne particulates:
 - a. Prevent deposition of dust and other particulates in HVAC ducts and equipment:
 - 1) Establish condition of existing ducts and equipment prior to start of alterations.
 - 2) Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
 - 2. Airborne contaminants:
 - a. Procedures and products have been specified to minimize indoor air pollutants:
 - 1) Furnish products meeting the Specifications.
 - 2) Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.
- E. Verification: HVAC system has been designed to achieve the minimum requirements for ventilation specified in ASHRAE 62.1, with verification provided by MEP Engineer of Record.

1.3 DEFINITIONS

- A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.

- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.4 SUBMITTALS

- A. See Section 01 33 00: Submittal Procedures.
- B. Submittals provided by Owner and/or the Commissioning Agent: To be reviewed by Contractor and submitted to Architect for processing.
- C. Indoor Air Quality Management Plan:
 - 1. Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA IAQ Guidelines for Occupied Buildings Under Construction as a guide (submit prior to pre-construction meeting):
 - a. Submit not less than 60 days before enclosure of building.
 - b. Identify potential sources of odor and dust.
 - c. Identify construction activities likely to produce odor or dust.
 - d. Identify areas of Project potentially affected, especially occupied areas.
 - e. Evaluate potential problems by severity and describe methods of control.
 - f. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters, and schedule for replacement of filters.
 - g. Describe cleaning and dust control procedures.
 - h. Describe measures to be taken for protection of absorptive materials.
 - i. Outline requirement for filtration for air handling equipment used during construction to use media with a minimum of MERV 8 at each return grill if permanently installed air handlers are used during construction.
- D. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors, or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.
- E. Duct and Terminal Unit Inspection Report.
- F. Air Contaminant Test Plan:
 - 1. Identify:
 - a. Testing agency qualifications.
 - b. Locations and scheduling of air sampling.
 - c. Test procedures, in detail.
 - d. Test instruments and apparatus.
 - e. Sampling methods.
- G. Air Contaminant Test Reports:
 - 1. Show:
 - a. Location where each sample was taken, and time.
 - b. Test values for each air sample; average the values of each set of three (3).
 - c. HVAC operating conditions.
 - d. Certification of test equipment calibration.
 - e. Other conditions or discrepancies that might have influenced results.
- H. Ventilation Effectiveness Test Plan:
 - 1. Identify:
 - a. Testing agency qualifications.
 - b. Description of test spaces, including locations or air sampling.
 - c. Test procedures, in detail; state whether tracer gas decay or step-up will be used.

- d. Test instruments and apparatus; identify tracer gas to be used.
 - e. Sampling methods.
- I. Ventilation Effectiveness Test Reports:
- 1. Include preliminary tests of instruments, apparatus, and test spaces.
 - 2. Calculation of ventilation effectiveness, E.
 - 3. Location where each sample was taken, and time.
 - 4. Test values for each air sample.
 - 5. HVAC operating conditions.
 - 6. Other information specified in ASHRAE 129.
 - 7. Other conditions or discrepancies that might have influenced results.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Low VOC Materials: See other Sections for specific requirements for materials with low VOC content.
- B. Auxiliary Air Filters: MERV of 8, minimum, when tested in accordance with ASHRAE 52.2.

PART 3 EXECUTION

3.1 CONSTRUCTION PROCEDURES

- A. Prevent the absorption of moisture and humidity by adsorptive materials:
 - 1. Sequence the delivery of such materials so that they are not present in the building until wet work is completed and dry.
 - 2. Deliver and store such materials in fully sealed moisture-impermeable packaging.
 - 3. Provide sufficient ventilation for drying within reasonable time frame.
- B. Begin construction ventilation when building is substantially enclosed.
- C. If extremely dusty or dirty, work must be conducted inside the building:
 - 1. Shut down HVAC systems for the duration.
 - 2. Remove dust and dirt completely before restarting systems.
- D. HVAC equipment and supply air ductwork may be used for ventilation during construction:
 - 1. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.
 - 2. Ensure that air filters are correctly installed prior to starting use:
 - a. Replace filters when they lose efficiency (for corridor HVAC only).
 - 3. Do not use return air ductwork for ventilation.
 - 4. Seal return air inlets or otherwise positively isolate return air system to prevent recirculation of air:
 - a. Provide alternate return air pathways (for corridor HVAC only).
- E. Do not store construction materials or waste in mechanical or electrical rooms.
- F. Prior to use of return air ductwork without intake filters, clean up and remove dust and debris generated by construction activities:
 - 1. Inspect duct intakes, return air grilles, and terminal units for dust.
 - 2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes, and conduit.

3. Clean tops of doors and frames.
 4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
 5. Clean return plenums of air handling units.
 6. Remove intake filters last after cleaning is complete.
- G. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.
- H. Use other relevant recommendations of SMACNA IAQ Guideline for Occupied Buildings Under Construction for avoiding unnecessary contamination due to construction procedures.

END OF SECTION 01 35 46

SECTION 01 40 00 QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated and paid by the District (or refer to Section 01 45 23: Testing and Inspecting Services). These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements:
 - 1. Specific quality assurance and quality control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and quality control procedures that facilitate compliance with Contract Document requirements.
 - 3. Requirements for Contractor to provide quality assurance and quality control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions.
 - 4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, experienced means having successfully completed a minimum of five (5) years' documented experience with projects similar in nature, size, and extent; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality Control Testing: Tests and inspections performed onsite for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector:
 - 1. Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operations, including installation, erection, application, and similar operations:
 - a. Use of trade specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- D. Mockups:
 - 1. Full size physical assemblies that are constructed onsite. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will

be judged:

- a. Laboratory mockups: Full size physical assemblies constructed at testing facility to verify performance characteristics.
 - b. Integrated exterior mockups: Mockups of exterior envelope erected separately from the building but on the Project site, consisting of multiple products, assemblies, and subassemblies.
 - c. Room mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
- E. Pre-Construction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- H. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include Contract enforcement activities performed by Architect.
- I. Source Quality Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- J. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two (2) or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 SUBMITTALS

- A. Shop Drawings:
1. Submit Plans, Sections, and elevations, indicating materials and size of mockup construction:
 - a. Indicate manufacturer and model number of individual components.
 - b. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

- B. Contractor's Statement of Responsibility:
 - 1. When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - a. Seismic force resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by Architect.
 - b. Main wind force resisting system or wind resisting component listed in the wind force resisting system quality assurance plan prepared by Architect.

- C. Schedule of Tests and Inspections:
 - 1. Prepare in tabular form and include the following:
 - a. Specification Section number and title.
 - b. Entity responsible for performing tests and inspections.
 - c. Description of test and inspection.
 - d. Identification of applicable standards.
 - e. Identification of test and inspection methods.
 - f. Number of tests and inspections required.
 - g. Time schedule or time span for tests and inspections.
 - h. Requirements for obtaining samples.
 - i. Unique characteristics of each quality control service.

1.6 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports:
 - 1. Prepare and submit certified written reports specified. Include the following:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making tests and inspections.
 - f. Description of the Work and test and inspection method.
 - g. Identification of product and Specification Section.
 - h. Complete test or inspection data.
 - i. Test and inspection results and an interpretation of test results.
 - j. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - k. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - l. Name and signature of laboratory inspector.
 - m. Recommendations on retesting and reinspecting.

- B. Manufacturer's Technical Representative's Field Reports:
 - 1. Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 - a. Name, address, and telephone number of technical representative making report.
 - b. Statement on condition of substrates and their acceptability for installation of product.
 - c. Statement that products at site comply with requirements.
 - d. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - e. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - f. Statement whether conditions, products, and installation will affect warranty.
 - g. Other required items indicated in individual Specification Sections.

- C. Factory Authorized Service Representative's Reports:
 - 1. Prepare written information documenting manufacturer's factory authorized service representative's tests and inspections specified in other Sections. Include the following:
 - a. Name, address, and telephone number of factory authorized service representative making report.
 - b. Statement that equipment complies with requirements.
 - c. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - d. Statement whether conditions, products, and installation will affect warranty.
 - e. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
- E. Trade Pre-Installation Conferences: Meeting minutes to be Contractor provided.

1.7 QUALITY ASSURANCE

- A. Qualifications establish the minimum qualification levels required; refer to individual Specification Sections for additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated and sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated and with record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of California and is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated.
- F. Specialists:
 - 1. Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated:
 - a. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. Testing Agency Qualifications:
 - 1. A NRTL, a NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, documented according to ASTM E329; with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities:
 - a. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - b. NVLAP: A testing agency accredited according to NIST's National Voluntary

Laboratory Accreditation Program.

- H. Manufacturer's Technical Representative Qualifications: An authorized representative of the manufacturer who is trained and approved by the manufacturer to observe and inspect installation of the manufacturer's products.
- I. Factory Authorized Service Representative Qualifications: An authorized representative of the manufacturer who is trained and approved by the manufacturer to inspect installation of the manufacturer's products.
- J. Pre-Construction Testing:
 - 1. Where testing agency is indicated to perform pre-construction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - a. Contractor responsibilities include the following:
 - 1) Provide test specimens representative of proposed products and construction.
 - 2) Submit specimens with sufficient time for testing and analyzing results to prevent delaying the Work.
 - 3) Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - 4) Build site assembled test assemblies and mockups using installers who will perform same tasks for the Project.
 - 5) Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - 6) When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on the Project.
 - 2. Testing agency responsibilities: Submit certified written report of each test, inspection, and similar quality assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
- K. Mockups:
 - 1. Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - a. Build mockups in location and of size indicated, or if not indicated, as directed by Architect.
 - b. Notify Architect a minimum of seven (7) days in advance of dates and times when mockups will be constructed.
 - c. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction.
 - d. Demonstrate the proposed range of aesthetic effects and workmanship.
 - e. Obtain Architect's approval of mockups before starting Work, fabrication, or construction. Allow seven (7) days for initial review and each re-review of each mockup.
 - f. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - g. Demolish and remove mockups when directed unless otherwise indicated.
- L. Integrated Exterior Mockups: Mockup of the exterior envelope erected separately from the building but on the Project site, consisting of multiple products, assemblies, and subassemblies. Mockup, if not specifically shown on the Drawings, shall be minimum eight feet by eight feet (8'x8'). Mockup shall include all major façade elements and at least one (1) window a minimum of two feet by two feet (2'x2') in size. Prior to constructing mockup, verify

requirements with Architect. Pre-installation conferences for trades involved in integrated exterior mockup shall be held after mockup is completed.

- M. Laboratory Mockups: Comply with requirements of pre-construction testing and those specified in individual Specification Sections.
- N. Trade Pre-Installation Conferences: Meeting minutes to be Contractor provided.

1.8 QUALITY CONTROL

- A. Owner Responsibilities:
 - 1. Where quality control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform the services:
 - a. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - b. Costs for retesting and re-inspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities:
 - 1. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality control activities required to verify that the Work complies with requirements, whether specified or not:
 - a. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - b. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform the quality control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - c. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - d. Where quality control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality control service.
 - e. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - f. Submit additional copies of each written report directly to authorities having jurisdiction when they so direct.
 - g. Provide documentation for construction safety as required by CBC Chapter 33 and CFC Chapter 33. Show representation for construction safeguards through the life of the Project.
- C. Manufacturer's Field Services: Where indicated, engage a factory authorized service representative to inspect field assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00: Submittal Procedures.
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Re-Inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract

Documents.

- F. Testing Agency Responsibilities:
 - 1. Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections:
 - a. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - b. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 - c. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
 - d. Submit a certified written report, in duplicate, of each test, inspection, and similar quality control service through Contractor.
 - e. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - f. Do not perform any duties of Contractor.

- G. Associated Services:
 - 1. Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - a. Access to the Work.
 - b. Incidental labor and facilities necessary to facilitate tests and inspections.
 - c. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - d. Facilities for storage and field curing of test samples.
 - e. Delivery of samples to testing agencies.
 - f. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - g. Security and protection for samples and for testing and inspecting equipment at the Project site.

- H. Coordination:
 - 1. Coordinate sequence of activities to accommodate required quality assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting:
 - a. Schedule times for tests, inspections, obtaining samples, and similar activities.

- I. Schedule of Tests and Inspections:
 - 1. Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses:
 - a. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.9 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections:
 - 1. Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections, as required by authorities having jurisdiction, as the responsibility of Owner, and as indicated in individual Specification Sections:
 - a. Verifying that manufacturer maintains detailed fabrication and quality control procedures, and reviews the completeness and adequacy of those procedures to perform the Work.

- b. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
- c. Submitting a certified written report of each test, inspection, and similar quality control service to Architect with copy to Contractor and to authorities having jurisdiction.
- d. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
- e. Interpreting tests and inspections and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
- f. Retesting and re-inspecting corrected Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log:
 1. Prepare a record of tests and inspections. Include the following:
 - a. Date test or inspection was conducted.
 - b. Description of the Work tested or inspected.
 - c. Date test or inspection results were transmitted to Architect.
 - d. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes:
 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 29: Cutting and Patching.
- B. Protect construction exposed by or for quality control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

END OF SECTION 01 40 00

SECTION 01 42 00 REFERENCES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. General: This Section specifies procedural and administrative requirements for compliance with governing regulations and codes and standards imposed upon the Work. These requirements include the obtaining of permits, licenses, inspections, releases, and similar statements, as well as payments, associated with regulations, codes, and standards.
- B. Governing Regulations:
 - 1. Refer to General and Supplementary Conditions for requirements related to compliance with governing regulations:
 - a. The Division of the State Architect (DSA), State of California provides design and construction oversight for this Project and as such is subject to the rules and regulations.

1.3 DEFINITIONS

- A. Approved: When used to convey Architect's action on Contractor's submittals, applications, and requests, approved is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- B. Basic Contract: Definitions are included in the Conditions of the Contract.
- C. Directed: A command or instruction by Architect. Other terms including requested, authorized, selected, required, and permitted have the same meaning as directed.
- D. Furnish: Supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- E. Indicated: Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including shown, noted, scheduled, and specified have the same meaning as indicated.
- F. Install: Operations at the Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- G. Project Site: Space available for performing construction activities. The extent of the Project site is shown on Drawings and may or may not be identical with the description of the land on which the Project is to be built.
- H. Provide: Furnish and install, complete and ready for the intended use.
- I. Regulations: Includes laws, statutes, ordinances, and lawful orders issued by governing authorities, as well as those rules, conventions, and agreements within the construction industry that effectively control the performance of the Work regardless of whether they are

lawfully imposed by a governing authority or not.

- J. Testing Agencies: An independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, to report on and, if required, to interpret results of those inspections or tests.

1.4 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference. Individual Specification Sections indicate which codes and standards Contractor must keep available at the Project site for reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Conflicting Requirements: Where compliance with two (2) or more standards is specified, and where these standards establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the Contract Documents specifically indicate a less stringent requirement. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to Architect/Engineer for a decision before proceeding.
- D. Minimum Quantities or Quality Levels: In every instance the quantity or quality level shown or specified is intended to be the minimum for the Work to be provided or performed. Unless otherwise indicated, the actual Work may either comply exactly, within specified tolerances, with the minimum quantity or quality specified, or may exceed that minimum within reasonable limits. In complying with these requirements, the indicated numeric values are either minimum or maximum values, as noted, or as appropriate for context of the requirements. Refer instances of uncertainty to Architect/Engineer for decision before proceeding.

1.5 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations - Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the trade association, standards-producing organization, authorities having jurisdiction, or other entity applicable to the context of the text provision:
 1. AABC - Associated Air Balance Council; www.aabc.com.
 2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
 3. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
 4. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
 5. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
 6. ACI - American Concrete Institute (formerly ACI International); www.concrete.org.
 7. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
 8. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
 9. AGA - American Gas Association; www.aga.org.
 10. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
 11. AI - Asphalt Institute; www.asphaltinstitute.org.
 12. AIA - American Institute of Architects (The); www.aia.org.
 13. AISC - American Institute of Steel Construction; www.aisc.org.
 14. AISI - American Iron and Steel Institute; www.steel.org.

15. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
16. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
17. ANSI - American National Standards Institute; www.ansi.org.
18. APA - The Engineered Wood Association; www.apawood.org.
19. APA - Architectural Precast Association; www.archprecast.org.
20. API - American Petroleum Institute; www.api.org.
21. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
22. ASCE - American Society of Civil Engineers; www.asce.org.
23. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
24. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
25. ASME - ASME International (American Society of Mechanical Engineers); www.asme.org.
26. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
27. ASSP - American Society of Safety Professionals (The); www.assp.org.
28. ASTM - ASTM International (American Society for Testing and Materials International); www.astm.org.
29. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
30. AWI - Architectural Woodwork Institute; www.awinet.org.
31. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
32. AWPA - American Wood Protection Association (formerly American Wood-Preservers' Association); www.awpa.com.
33. AWS - American Welding Society; www.aws.org.
34. AWWA - American Water Works Association; www.awwa.org.
35. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
36. BIA - Brick Industry Association (The); www.gobrick.com.
37. BICSI - BICSI, Inc.; www.bicsi.org.
38. BIFMA - BIFMA International (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
39. BOCA - BOCA (Building Officials and Code Administrators International Inc.); (See ICC).
40. CEA - Consumer Electronics Association; www.ce.org.
41. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
42. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
43. CGA - Compressed Gas Association; www.cganet.com.
44. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
45. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
46. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
47. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
48. CPA - Composite Panel Association; www.pbmdf.com.
49. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
50. CRRC - Cool Roof Rating Council; www.coolroofs.org.
51. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
52. CSA - Canadian Standards Association; www.csa.ca.
53. CSA - CSA International (formerly IAS - International Approval Services); www.csa-international.org.
54. CSI - Construction Specifications Institute (The); www.csinet.org.
55. CTI - Cooling Technology Institute (formerly Cooling Tower Institute); www.cti.org.
56. CWC - Composite Wood Council; (See CPA).
57. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
58. DHI - Door and Hardware Institute; www.dhi.org.
59. DSA - Division of the State Architect, State of California.

60. ECA - Electronic Components Association; www.ec-central.org.
61. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
62. EIA - Electronic Industries Alliance; (See TIA).
63. EIMA - EIFS Industry Members Association; www.eima.com.
64. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
65. ESD - ESD Association (Electrostatic Discharge Association); www.esda.org.
66. ESTA - Entertainment Services and Technology Association; (See PLASA).
67. EVO - Efficiency Valuation Organization; www.evo-world.org.
68. FM Approvals - FM Approvals LLC; www.fmglobal.com.
69. FM Global - FM Global (formerly FMG - FM Global); www.fmglobal.com.
70. FSC - Forest Stewardship Council U.S.; www.fscus.org.
71. GA - Gypsum Association; www.gypsum.org.
72. GANA - Glass Association of North America; www.glasswebsite.com.
73. GS - Green Seal; www.greenseal.org.
74. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
75. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
76. HPW - H.P. White Laboratory, Inc.; www.hpwhite.com.
77. ICBO - International Conference of Building Officials; (See ICC).
78. ICC - International Code Council; www.iccsafe.org.
79. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
80. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
81. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
82. IEC - International Electrotechnical Commission; www.iec.ch.
83. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
84. IES - Illuminating Engineering Society (formerly Illuminating Engineering Society of North America); www.ies.org.
85. IESNA - Illuminating Engineering Society of North America; (See IES).
86. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
87. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
88. IGSHPA - International Ground Source Heat Pump Association;
www.igshpa.okstate.edu.
89. Intertek - Intertek Group (formerly ETL SEMCO; Intertek Testing Service NA);
www.intertek.com.
90. ISA - International Society of Automation (The) (formerly Instrumentation, Systems,
and Automation Society); www.isa.org.
91. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
92. ISFA - International Surface Fabricators Association (formerly International Solid
Surface Fabricators Association); www.isfanow.org.
93. ISO - International Organization for Standardization; www.iso.org.
94. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
95. ITU - International Telecommunication Union; www.itu.int/home.
96. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
97. LMA - Laminating Materials Association; (See CPA).
98. LPI - Lightning Protection Institute; www.lightning.org.
99. MBMA - Metal Building Manufacturers Association; www.mbma.com.
100. MCA - Metal Construction Association; www.metalconstruction.org.
101. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
102. MHIA - Material Handling Industry of America; www.mhia.org.
103. MIA - Marble Institute of America; www.marble-institute.com.
104. MMPA - Moulding & Millwork Producers Association (formerly Wood Moulding &
Millwork Producers Association); www.wmmpa.com.
105. MPI - Master Painters Institute; www.paintinfo.com.
106. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry
Inc.; www.mss-hq.org.
107. NAAMM - National Association of Architectural Metal Manufacturers;
www.naamm.org.

108. NACE - NACE International (National Association of Corrosion Engineers International); www.nace.org.
109. NADCA - National Air Duct Cleaners Association; www.nadca.com.
110. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
111. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
112. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
113. NCMA - National Concrete Masonry Association; www.ncma.org.
114. NEBB - National Environmental Balancing Bureau; www.nebb.org.
115. NECA - National Electrical Contractors Association; www.necanet.org.
116. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
117. NEMA - National Electrical Manufacturers Association; www.nema.org.
118. NETA - InterNational Electrical Testing Association; www.netaworld.org.
119. NFHS - National Federation of State High School Associations; www.nfhs.org.
120. NFPA - NFPA (National Fire Protection Association); www.nfpa.org.
121. NFPA - NFPA International; (See NFPA).
122. NFRC - National Fenestration Rating Council; www.nfrc.org.
123. NHLA - National Hardwood Lumber Association; www.nhla.com.
124. NLGA - National Lumber Grades Authority; www.nlga.org.
125. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
126. NRCA - National Roofing Contractors Association; www.nrca.net.
127. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
128. NSF - NSF International (National Sanitation Foundation International); www.nsf.org.
129. NSPE - National Society of Professional Engineers; www.nspe.org.
130. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
131. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
132. NWFA - National Wood Flooring Association; www.nwfa.org.
133. PDI - Plumbing & Drainage Institute; www.pdionline.org.
134. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
135. RFCI - Resilient Floor Covering Institute; www.rfci.com.
136. RIS - Redwood Inspection Service; www.redwoodinspection.com.
137. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
138. SDI - Steel Deck Institute; www.sdi.org.
139. SDI - Steel Door Institute; www.steeldoor.org.
140. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
141. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
142. SIA - Security Industry Association; www.siaonline.org.
143. SJI - Steel Joist Institute; www.steeljoist.org.
144. SMA - Screen Manufacturers Association; www.smainfo.org.
145. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
146. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
147. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
148. SPIB - Southern Pine Inspection Bureau; www.spib.org.
149. SPRI - Single Ply Roofing Industry; www.spri.org.
150. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
151. SSINA - Specialty Steel Industry of North America; www.ssina.com.
152. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
153. STI - Steel Tank Institute; www.steeltank.com.
154. SWI - Steel Window Institute; www.steelwindows.com.
155. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
156. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
157. TCNA - Tile Council of North America, Inc. (formerly Tile Council of America); www.tileusa.com.

158. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
 159. TIA - Telecommunications Industry Association (formerly TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
 160. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
 161. TMS - The Masonry Society; www.masonrysociety.org.
 162. TPI - Truss Plate Institute; www.tpinst.org.
 163. TPI - Turfgrass Producers International; www.turfgrasssod.org.
 164. TRI - Tile Roofing Institute; www.tilerroofing.org.
 165. UBC - Uniform Building Code; (See ICC).
 166. UL - Underwriters Laboratories Inc.; www.ul.com.
 167. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
 168. USAV - USA Volleyball; www.usavolleyball.org.
 169. USGBC - U.S. Green Building Council; www.usgbc.org.
 170. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
 171. WASTEC - Waste Equipment Technology Association; www.wastec.org.
 172. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
 173. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
 174. WDMA - Window & Door Manufacturers Association; www.wdma.com.
 175. WI - Woodwork Institute (formerly WIC - Woodwork Institute of California); www.wicnet.org.
 176. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
 177. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
 178. WPA - Western Wood Products Association; www.wwpa.org.
- B. Standards and Regulations - Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations:
1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
 2. FED-STD - Federal Standard; (See FS).
 3. USAB - United States Access Board; www.access-board.gov.
 4. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- C. Code Agencies - Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the Agency:
1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
 2. ICC - International Code Council; www.iccsafe.org.
 3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.
- D. State Government Agencies - Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents:
1. CBHF - State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
 2. CCR - California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
 3. CDHS - California Department of Health Services; (See CDPH).
 4. CDPH - California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
 5. CPUC - California Public Utilities Commission; www.cpuc.ca.gov.
 6. CBC – California Building Code (2022 Edition).

7. CEC – California Electrical Code (2022 Edition).
8. CMC – California Mechanical Code (2022 Edition).
9. CFC – California Fire Code (2022 Edition).

1.6 SUBMITTALS

- A. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 42 00

SECTION 01 45 23 TESTING AND INSPECTING SERVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements and qualifications including but not limited to:
 - 1. Professional testing and laboratory services.
 - 2. Accessories necessary for the completion of testing and laboratory services.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements:
 - 1. Specific quality assurance and quality control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and quality control procedures that facilitate compliance with Contract Document requirements.
 - 3. Requirements for Contractor to provide quality assurance and quality control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions.
 - 4. Specific test and inspection requirements are not specified in this Section.
- C. A Qualified Independent Testing Laboratory and/or Geotechnical Engineering Service Selected and Paid by Owner:
 - 1. Per CAC 4-335 (b): The school board shall pay for all tests/inspections, but if so specified the amount or a portion thereof may be collected from the contractor by the school board. When in the opinion of the architect or registered engineer, additional test/inspections are required because of the manner in which the contractor executes his or her work, such test/inspections shall be paid for by the school board, but if so specified the amount paid may be collected for the contractor by the school board. Examples of such test/inspection are: tests of material substituted for previously accepted materials, retests of re-inspections made necessary by the failure of material to comply with the requirements of the approved construction documents and specifications, and load test necessary because certain portions of the structure have not fully met specification or plan requirements.
- D. Inspecting agency shall perform inspections and tests in accordance with the rules and regulations of the building code, local authorities, specifications of ASTM, and the Contract Documents.
- E. Materials and workmanship found not in compliance with required standards or performance obligations shall be removed and replaced. Cost may be collected from the contractor by the School Board per CAC 4-335 (b).
- F. Where terms "Inspector" and "Laboratory" are used, it is meant and in reference to an officially designated and accredited inspector of the testing laboratory or geotechnical service engaged by Owner.

- G. Laboratory inspections shall not relieve Contractor or fabricator of his responsibility to furnish materials and workmanship in accordance with the Contract Documents.
- H. Contractor or fabricator shall cooperate with the testing laboratory in matters pertaining to the Work.
- I. Contractor to address deficiency and failed reports.

1.3 SUBMITTALS

- A. Schedule of Tests and Inspections:
 - 1. Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses:
 - a. Prepare in tabular form and include the following:
 - 1) Specification Section number and title.
 - 2) Entity responsible for performing test and inspection.
 - 3) Description of test and inspection.
 - 4) Identification of applicable standards.
 - 5) Identification of test and inspection methods.
 - 6) Number of tests and inspections required.
 - 7) Time schedule or time span for tests and inspections.
 - 8) Requirements for obtaining samples.
 - 9) Unique characteristics of each quality control service.
- B. Test and Inspection Reports:
 - 1. Prepare and submit certified written reports specified. Include the following:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making tests and inspections.
 - f. Description of the Work and test and inspection method.
 - g. Identification of product and Specification Section.
 - h. Complete test or inspection data.
 - i. Test and inspection results and an interpretation of test results.
 - j. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - k. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - l. Name and signature of laboratory inspector.
 - m. Recommendations on retesting and re-inspecting.
- C. Submit copies of reports of each inspection and test:
 - 1. Owner, program or project manager, Architect, and each engineer or outside consultants regarding their particular phase of the Project: One (1) copy each.
 - 2. Construction Manager (CM) and Contractor: Two (2) copies each.
- D. In addition to furnishing a written report, notify the CM and Contractor verbally of uncorrected conditions or failures to comply with requirements of the Contract Documents, and immediately fax and email corresponding report to Architect and the engineer.
- E. At completion of each trade or branch of Work requiring inspecting and testing, submit a final certificate attesting to satisfactory completion of Work.

- F. Report full compliance with requirements of the Contract Documents.
- G. Submit copies of test results sealed by a registered engineer to municipal authorities having jurisdiction, as required.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. The 2022 California Administrative Code (Title 24, Part 2, Volume 2) describes the general administrative requirements for the Project under the jurisdiction of the Division of the State Architect (DSA). Included is a list of inspections coordinated with CBC Section listings. These provisions require that a structural test for construction projects under DSA jurisdiction be performed by testing laboratories acceptable to DSA. DSA administers the Laboratory Evaluation and Acceptance Program to evaluate laboratories for structural testing and special inspection services. A NRTL, a NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, documented according to ASTM E329 and ASTM E534, and with additional qualifications specified in individual Sections:
 - a. NRTL: A Nationally Recognized Testing Laboratory according to 29 CFR 1910.7.
 - b. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
 - c. Laboratory Evaluation and Acceptance program to evaluate laboratories acceptable to DSA.
 - d. Testing agencies shall be insured against errors and omissions by a professional liability insurance policy having a minimum limit of liability of \$500,000.00.
- B. Inspection and testing services for the testing agency shall be under the direction of a California Registered Engineer, charged with engineering managerial responsibility, and having a minimum of five (5) years' engineering experience in inspection and testing of construction materials.
- C. Concrete Inspectors: Inspecting personnel monitoring concrete work shall be ACI certified inspectors.
- D. Structural Steel:
 - 1. Primary inspectors performing structural steel inspection shall be currently certified AWS Certified Welding Inspectors (CWI), in accordance with the provisions of AWS QCI, *Standard and Guide for Qualification and Certification of Welding Inspectors*:
 - a. Inspector may be supported by assistant inspectors who perform specific inspection functions under the direct supervision of the primary inspector. Assistant inspectors shall be currently certified AWS Certified Associate Welding Inspectors (CAWI). Work of assistant inspectors shall be monitored daily by the inspector.
- E. Testing Equipment: Equipment shall be calibrated at intervals not exceeding 12 months by devices of accuracy traceable to the National Bureau of Standards.
- F. Referenced Standards: Latest adopted edition of standards referenced apply to the Work. In the event of conflict between the Contract Documents and referenced standards, the Contract Documents shall govern. In case of conflict between Contract Documents and the California Building Code, the more stringent shall govern.

- G. Owner Responsibilities:
1. Where quality control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform the services:
 - a. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - b. Costs for retesting and re-inspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- H. Contractor Responsibilities:
1. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality control activities required to verify that the Work complies with requirements, whether specified or not:
 - a. Refer to individual Specification Sections for specific requirements.
 - b. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - c. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform the quality control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - d. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - e. Where quality control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality control service.
 - f. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - g. Submit additional copies of each written report directly to authorities having jurisdiction when they so direct.
 - h. Associated responsibilities and services - Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel:
 - 1) Provide the following:
 - a) Provide access to the Work.
 - b) Samples or specimens of material for testing shall be taken by a qualified representative of the laboratory of record. In no case shall the contractor or vendor select the sample location or obtain specimens per CAC 4-335 (c).
 - c) Advise laboratory and Architect sufficiently in advance of construction operations to allow laboratory to complete required inspections or tests and to assign personnel for field inspection and testing as specified.
 - d) Provide facilities for storage and curing of concrete test samples on site for the first 24 hours and for subsequent field curing required by ASTM C31.
 - e) Incidental labor, facilities, and equipment necessary to assist laboratory personnel in obtaining and handling samples at the site.
 - f) Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - g) Provide concrete mix designs in accordance with ACI 301 made by an independent testing laboratory or qualified concrete supplier. Where mix designs by an independent testing laboratory are required, select and pay for laboratory.
 - h) Obtain required inspections or approvals of the building official. Inspection requests and notifications required by building code are responsibility of Contractor.
 - i) Provide current welder certificates for each welder employed.

- j) Provide fabrication and erection inspection and testing of welds in accordance with AWS D1.1, Chapter 6.
 - k) Use prequalification of welding procedures in executing the Work.
 - l) Security and protection for samples and for testing and inspecting equipment at the Project site.
 - i. Retesting/re-inspecting: Regardless of payment responsibility of the original tests or inspections, provide quality control services, including retesting and re-inspecting, for construction that replaced Work failing to comply with the Contract Documents, code requirements, or what is required from DSA.
 - I. Testing Agency Responsibilities:
 - 1. Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections:
 - a. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - b. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 - c. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
 - d. Submit a certified written report, in duplicate, of each test, inspection, and similar quality control service through Contractor.
 - e. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - f. Do not perform any duties of Contractor.
 - J. Authority and Duties of Laboratory Personnel:
 - 1. A representative of the testing laboratory, who has reviewed and is familiar with the Project and Specifications, shall participate in pre-construction conferences. The representative shall coordinate material testing and inspection requirements with Contractor and its subcontractors consistent with the planned construction schedule. The laboratory representative shall attend conferences required or requested to address quality control issues.
 - 2. Laboratory personnel shall inspect and test materials, assemblies, specimens, and Work performed, including design mixes, methods and techniques, and report the progress to Architect.
 - 3. If material or Work fails to meet requirements of the Contract Documents, the laboratory inspector shall notify the CM, Architect, engineers, supplier, or Subcontractor providing or preparing the materials or Work being tested of such failure.
 - 4. Laboratory personnel shall not perform the work of Contractor or act as foremen or superintendents. Work will be inspected as it progresses, but failure to detect defective Work or materials shall not prevent later rejection when a defect is discovered.
 - 5. Laboratory personnel are not authorized to revoke, alter, relax, enlarge, or release the requirements of the Contract Documents or approve or accept portions of Work, except where approval is specifically specified in the Specifications.
 - 6. Comply with building code requirements for special inspections.
 - K. Testing Laboratory Guidelines and Procedures:
 - 1. Technicians scheduled to perform specific testing services must be qualified to review and perform other services that overlap, i.e. earthwork, foundation inspections, rebar inspection, and concrete when scheduled concurrently at the site.
 - 2. Technician time for services performed will be reimbursed at a regular time rate. Compensation at the overtime rate will be considered for hours over eight (8) hours spent at the site on a single day, field testing services performed on a Saturday or Sunday, and field services performed on a recognized holiday.
 - 3. There shall be a three (3) hour minimum for each scheduled testing service. Vehicle charges will be included on a \$25.00 per trip basis.

4. Cylinder pick up will be controlled by the technician performing test on a scheduled pick up day. If there are no testing services scheduled, the cylinder pick up fee is \$40.00 on week days and \$50.00 on weekends and holidays with no technician or vehicle charge.
 5. Contractor shall bear the responsibility of scheduling the testing services. Contractor and the testing laboratory shall assume full responsibility to coordinate the testing services. Cancellations or failed test shall be reimbursable to the Owner by the responsible party for the cancellations or failure of a test or service.
- L. Coordination:
1. Coordinate sequence of activities to accommodate required quality assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting:
 - a. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log:
1. Prepare a record of tests and inspections. Include the following:
 - a. Date test or inspection was conducted.
 - b. Description of the Work tested or inspected.
 - c. Date test or inspection results were transmitted to Architect.
 - d. Identification of testing agency or special inspector conducting test or inspection.
 - e. Deficiency log.
- B. Maintain log at site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 TESTING AND INSPECTION SERVICES

- A. Testing services shall include, but not be limited to those specified below or which are necessary or required during course of construction to ascertain Specification compliance and which may be deemed necessary by Architect, the engineer, or Owner to ensure the quality of the Work.
- B. Owner reserves the right to add to or delete any or all inspection and testing specified, excluding testing required by the applicable building codes.
- C. If conflicts arise between Drawings and Specifications, notify Architect immediately. The most stringent requirements shall dictate procedure.

3.3 TESTING OF EARTHWORK

- A. Testing Services (as specified or required):
1. References (as applicable for tests required):
 - a. American Society for Testing and Materials (ASTM):
 - 1) D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³ (600 kN-m/m³).
 - 2) D2922 - Standard Test Method for Density of Soil and Soil-Aggregate In Place By Nuclear Methods (Shallow Depth).

- 3) D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - b. American Association of State Highway and Transportation Officials (AASHTO):
 - 1) T89 - Determining the Liquid Limit of Soils.
 - 2) T90 - Determining the Plastic Limit and Plasticity Index of Soils.
 - 3) T99 - Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb) Rammer and a 305-mm (12-in) Drop.
 - 4) T238 - Density of Soil and Soil Aggregates In Place By Nuclear Methods (Shallow Depth).
 2. Perform sieve analysis to develop grain size distribution curves for materials to be used for subgrade, fill under slab on grade, and backfills.
 3. Establish the moisture density relation of soils to be used as fill using the method best suited to the type of fill material.
 4. Determine moisture content of all fill materials before placement and advise Contractor when it is or is not suitable to achieve required compaction.
 5. Determine Liquid Limit in accordance with ASTM D4318 or AASHTO T89, Plastic Limit in accordance with ASTM D4318, and Plasticity Index in accordance with ASTM D4318 of all fill material,
 6. Perform one (1) in place density test for each 2,500 square feet (280 square yards) of existing subgrade material.
 7. Perform Moisture-Density curve in accordance with ASTM D698 or AASHTO T99 for one type of fill material. If the original choice of material does not meet the Specifications, Contractor shall pay for additional testing.
 8. Perform in place density tests of each lift of compacted fill at locations adequate to evaluate the degree of compaction of all fill areas. Conduct one test for each 2,500 square feet (280 square yards) of each lift of compacted fill.
 9. Perform testing at a frequency of one (1) in-place density and moisture test for each 75 lineal feet or less of utility trench, with a minimum of three (3) tests per lift
- B. Reports:
1. Submit reports with the following information:
 - a. Type and condition of soil at footing bottoms.
 - b. Level of water table in the excavated areas.
 - c. Grain size distribution of fill materials (average of three [3] tests).
 - d. Moisture density test results.
 - e. In place density test results with moisture content and relative density of each layer of compacted fill. Include with in place density test results, a plan showing location of each test.
 - f. Notify Architect by telephone within one (1) hour of the discovery of the following conditions and follow up telephone notification with written report:
 - 1) Materials used or degree of soil compaction not meeting specified requirements.
 - 2) Frost and freeze protection requirements for excavation bottoms not being complied with.
 - 3) Water in excavations not being removed prior to Work being performed in excavation.

3.4 INSPECTION OF PIPED SITE UTILITIES

- A. Laboratory representative shall observe and report on the following:
1. Proper alignment and grade of trenches.
 2. Pipe bedding and supports.
 3. Pipe, joints, jointing material, and thrust blocks prior to installation of pipe.
 4. Installation of pipe and joints.
 5. Testing of piped utilities performed by Contractor.

3.5 PAVING

- A. Testing Services:
 - 1. Perform field tests for moisture density properties:
 - a. Provide field testing of the subgrade as specified.
 - b. Paving sub-base: Provide one (1) field test for every 5,000 square feet of area of crushed limestone or caliche sub-base.
 - c. Lime treated subgrade: Provide one (1) field test for every 5,000 square feet of area of lime treated subgrade for content of lime and subgrade compaction.
 - d. Cement soil stabilization: Provide one (1) field test for every 5,000 square feet of area of cement stabilized subgrade for content of cement and subgrade compaction.

3.6 PIER DRILLING OPERATION

- A. A representative of a qualified geotechnical laboratory shall provide services specified.
- B. Laboratory representative shall make continuous inspections to determine that proper bearing stratum is obtained and utilized for bearing and that shafts are properly clean and dry before placing concrete.
- C. Laboratory shall furnish complete pier log showing the diameter, top and bottom elevations of each pier, casing required or not required, actual penetration into bearing stratum, elevation of top of bearing stratum, volume of concrete used, and deviations from specified tolerances.
- D. Laboratory representative shall make continuous inspections of drilled pier construction to check the following:
 - 1. Verify soundness of bearing stratum and desired penetration.
 - 2. Verify pier dimensions and reinforcing used.
 - 3. Monitor condition of hole and removal of water and loose material from bottom.
 - 4. Monitor placement of concrete and use of tremie or pumps.
 - 5. Monitor the extraction of casing, if used.
- E. Request probe holes when deemed necessary to confirm safe bearing capacity.

3.7 CONCRETE REINFORCING STEEL AND EMBEDDED METAL ASSEMBLIES

- A. Inspect concrete reinforcing steel prior to placing concrete for compliance with Contract Documents and approved shop drawings. Noncompliance with Contract Documents and approved shop drawings shall be immediately brought to the attention of Contractor for correction and, if left uncorrected, reported to Architect.
- B. Laboratory representative shall observe and report on the following:
 - 1. Number and size of bars.
 - 2. Bending and lengths of bars.
 - 3. Splicing.
 - 4. Clearance to forms, including chair heights.
 - 5. Clearance to sides and bottom of trench if soil formed.
 - 6. Clearance between bars or spacing.
 - 7. Rust, form oil, and other contamination.
 - 8. Grade of steel.
 - 9. Securing, tying, and chairing of bars.
 - 10. Excessive congestion of reinforcing steel.
 - 11. Installation of anchor bolts and placement of concrete around such bolts.

12. Fabrication and installation of embedded metal assemblies, including visual inspection of all welds.
 13. Visually inspect studs and deformed bar anchors on embedded assemblies for compliance with Contract Documents. Check number, spacing, and weld quality. If, after welding, visual inspection reveals that a sound weld or a full 360-degree fillet has not been obtained for a particular stud or bar, such stud or bar shall be struck with a hammer and bent 15 degrees off perpendicular and then bent back into position. Anchors failing this test shall be replaced.
- C. Provide a qualified, experienced inspector to inspect reinforcing steel. Inspector shall have a minimum of three (3) years of experience inspecting reinforcing steel in projects of similar size.

3.8 CONCRETE INSPECTION AND TESTING

- A. Receive and evaluate proposed concrete mix designs submitted by Contractor. If mix designs comply with Drawings and Specifications, the laboratory shall submit a letter to the Architect certifying compliance. Mix designs not complying with Drawings and Specifications shall be returned by the laboratory as being unacceptable. Check the proposed mixes for proportions, water cement ratio, and slump in accordance with ACI 613 and 318.
- B. Comply with ACI 311 *Guide For Concrete Inspection* and ACI *Manual of Concrete Inspection*.
- C. Sample and test concrete placed at the site in accordance with ASTM C172. Each sample shall be obtained from a different batch of concrete on a random basis.
- D. Test concrete:
1. Mold and cure five (5) specimens from each sample:
 - a. For each 50 cubic yards or fraction thereof of structural building concrete.
 - b. For each 100 cubic yards or fraction thereof of nonstructural concrete and site Work paving and sidewalks.
 - c. Laboratory cure two (2) cylinders in accordance with ASTM C192.
 - d. Field cure remaining cylinders in accordance with ASTM C31.
 2. Two (2) specimens shall be tested at seven (7) days for information, two (2) shall be tested at 28 days for acceptance.
 3. Store one (1) cylinder for testing at 56 days in the event the 28-day strength tests do not meet strength requirements.
- E. Deviations from the requirements of ASTM specifications shall be recorded in the test report. Test concrete specimens in accordance with ASTM C39.
- F. Specimens for pumped concrete shall be taken at the discharge end of pumping equipment.
- G. Supervise curing and protection provided for test specimens in field and transportation from the field to laboratory. Test cylinders shall be stored in the field for 24 hours and then carefully transported to laboratory and cured in accordance with ASTM C31.
- H. Make one (1) strength test (four [4] cylinders) of each mix design of concrete placed in any one (1) day.
- I. Make one (1) slump test for each set of cylinders following procedural requirements of ASTM C143 and ASTM C172. Make additional slump tests whenever consistency of concrete appears to vary. Slump tests corresponding to samples from which strength tests are made shall be reported with strength test results. Other slump tests need not be reported.

- J. Determine total air content of air entrained normal weight concrete sample for each strength test in accordance with ASTM C231.
- K. Determine air content and unit weight of lightweight concrete sample for each strength test in accordance with ASTM C173 and ASTM C567.
- L. Determine temperature of concrete sample for each strength test.
- M. Inspect each batch of concrete and monitor addition of mixing water to assure uniform consistency from truck to truck. Check mixing form mixers before mix begins to set and within time limits set forth in ASTM C94:
 - 1. Monitor addition of water and high range water reducer to concrete at job site and length of time concrete is allowed to remain in truck during placement.
- N. Testing agency shall furnish and maintain a competent inspector at the mixing plant at the start of each day's mixing. Inspector shall examine concrete materials for compliance with Specifications and approved mix design, weighing and measuring devices, proportioning and mixing of materials, water and cement content of each batch, general operation of the plant, and transportation of concrete to jobsite. Inspector shall verify that the amount of free surface moisture contained in fine and course aggregate has been properly accounted for in the concrete mixing to achieve required consistency and water cement ratio.
- O. Testing laboratory shall monitor addition of water to concrete at the jobsite and the length of time concrete is allowed to remain in the truck before placement. Inspector shall compare mixture with criteria on the approved mix design and report any significant deviation to Architect, Contractor, and concrete supplier. Do not permit addition of water that will exceed maximum water/cement ratio for the mix as given on the approved mix design.
- P. Observe placing of concrete except nonstructural slabs on grade and site Work. Observe and report on placing method, consolidation, cold joints, length of drop, and displacement of reinforcement. Report deficiencies to Contractor immediately for corrective action. Inspections may be reduced to a periodic basis when all procedures have been deemed satisfactory by the laboratory.
- Q. Test reports shall include but not be limited to the following information:
 - 1. Date of concrete placement.
 - 2. Concrete mix identification number or proportion of ingredients.
 - 3. Truck ticket number.
 - 4. Time test was made.
 - 5. Time of batching.
 - 6. Location of each placement.
 - 7. Slump, unit weight, water content (microwave test), and air content of concrete sampled.
 - 8. Date and results of strength test.
- R. Report promptly to Architect all details of reasons for rejection of any and all quantities of concrete. Give all information concerning locations of the concrete pours, quantities, date of pours, and other pertinent facts concerning concrete represented by the specimens.
- S. Testing laboratory shall certify each delivery ticket indicating class of concrete delivered (or placed), amount of water added and time at which cement and aggregate were dispensed into the truck, and time at which concrete was discharged from the truck.

- T. Evaluation and Acceptance:
 - 1. If measured slump or air content of air entrained concrete falls outside specified limits, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, concrete shall be considered to have failed to meet the requirements of the Specifications, and shall not be used in the structure.
 - 2. Strength level of concrete will be considered satisfactory if the averages of sets of three (3) consecutive strength test results are equal to, or exceed, specified strength and no individual test result (average of two [2] cylinders) is below specified strength by more than 500 psi.
 - 3. Completed concrete work will be accepted when requirements of ACI 301 Chapter 18 *Specifications for Structural Concrete for Buildings* have been met.

- U. Concrete Test Reports:
 - 1. Reports shall be made and distributed immediately after respective tests or inspections are made:
 - a. Where reports indicate deviations from Contract Documents, they shall also include a determination of the probable cause of deviation and where applicable, a recommendation for corrective action.

- V. Furnish a statistical analysis for each class of concrete placed on the Project in accordance with ACI 214 and ACI 318. Information shall be updated and distributed once a month as directed by the Architect. Information shall include, but not be limited to, the following:
 - 1. Strength tests at seven (7) days.
 - 2. Strength tests at 28 days of two (2) cylinder averages.
 - 3. 28-day moving average strength tests of last three (3) test groups.
 - 4. Standard deviation and coefficient of variation based on 28-day strength tests.
 - 5. Average strength and number of 28-day tests for most recent month.
 - 6. Strength test one (1) cylinder at 56 days in the event the 28-day strength tests do not meet strength requirements.

- W. Test Footings (Shafts; Piers; Caissons): Same diameter and type specified for footings, placed in same manner. Accepted test footings may be used in the Work.

- X. Noncompliant Test Reports: Fax test reports indicating noncompliance immediately to each party on the test report distribution list. Copies shall be on different colored paper.

- Y. Inspect application of curing compound and monitor curing conditions to assure compliance with Specification requirements. Report curing deficiencies to Contractor immediately and submit a written report to Architect.

3.9 TESTING OF NONSHRINK GROUT

- A. Make one (1) strength test for all plates grouted and for all grout used in joints between members.

- B. Each test shall consist of four (4) cubes, two (2) tested at seven (7) days and two (2) at 28 days, made and tested in accordance with ASTM C109, with the exception that grout shall be restrained from expansion by a top plate.

3.10 STRUCTURAL STEEL

- A. Inspect structural steel during and after erection for compliance with Contract Documents and shop drawings. Review and report on fabricator's quality control procedures and capabilities.

- B. Field Inspection:
1. Proper erection of pieces.
 2. Proper touch up painting of shop primed structural steel exposed to view or in crawl space.
 3. Proper installation of bolts.
 4. Plumbness of structure and proper bracing.
 5. Proper field painting.
 6. Initial inspection of welding process and periodically thereafter as necessary.
 7. Visual examination of completed welds.
 8. Ultrasonic testing of penetration field welds.
 9. Installation of field welded shear studs.
 10. Inspect shop fabricated members, upon arrival at the site, for defects incurred during transit and handling.
 11. Measure and record camber of beams upon arrival and before erection for compliance with specified camber. Measure lying flat with web horizontal. Return members outside specified camber tolerance to shop for correction.
- C. Qualifications of Welders: Fabricator and erector shall provide the testing laboratory with names of welders employed on Work, along with certification that each welder has passed qualification tests within the past 12 months, using procedures covered in AWS D1.1 *Structural Welding Code - Steel*. Verify welder qualifications.
- D. Inspection of Field Welding shall Include:
1. Visually inspect fillet welds for size, soundness, and proper return around ends. Inspect seams, folds, and delaminations.
 2. Visually inspect welds for proper repair of painting.
 3. Ultrasonically test penetration welds in accordance with ASTM E164.
 4. Inspect surfaces to be welded. Note surface preparations, fit up, and cleanliness of surface. Verify electrodes for size, type, and condition.
 5. Welding inspector shall be present during alignment and fit up of members being welded, and shall verify for correct surface preparation of root openings, sound weld metal, and proper penetration in the root pass. Where weld has not penetrated completely, inspector shall order the joint to be chipped down to sound metal, or gouged out, and rewelded. Thoroughly inspect root passes for cracks. Gouge out cracks and rewelded to two inches (2") beyond each end of crack.
 6. Inspector shall verify that welds have been marked with welder's symbol and shall mark welds requiring repairs and re-inspection. Inspector shall maintain a written record of welds. Work completed and inspected shall receive an identification mark by the inspector. Identify unacceptable material and Work identified by word *reject* or *repair* marked directly on the material.
 7. Testing agency shall advise the Owner and Architect of any shop and/or field conditions that may require further tests and examination by means other than those specified. Additional tests and examinations shall be performed as authorized by the Owner and Architect.
 8. Owner reserves the right to use ultrasonic or radiographic inspection to verify adequacy of welds. Testing procedures and acceptance criteria shall be as specified in AWS D1.1.
 9. Weld quality to comply with the American Institute of Steel Construction (AISC) Manual of Steel Construction.
 10. Determine percentage of weld tested by the number of welds that fail the initial testing.
 11. Reweld and retest welds that fail until the welds pass. Test two (2) additional welds for every weld failure.
- E. Inspect bolted construction in accordance with AISC *Specification for Structural Steel Buildings*:
1. Visually inspect bolts ensuring that plies have been brought into snug contact.

2. Inspect high strength bolt in accordance with Section 9 of the *Specifications for Structural Joints Using ASTM A325 Bolts*.
- F. Inspect stud welding in accordance with AWS D1.1 *Structural Welding Code*:
1. Weld at least two (2) shear studs at the start of each production period to determine correct generator, control unit, and stud welder setting. The studs shall be capable of being bent 45 degrees from vertical without weld failure.
 2. When the temperature is below 32 degrees F, test one (1) stud in each 100 after cooling. Do not weld studs at temperatures below zero (0) degrees F or when surface is wet with rain or snow. If stud fails in the weld, two (2) new studs shall pass the test before resumption of welding.
 3. Visually inspect studs for compliance with the requirements of the Contract Documents. Verify number, spacing, and weld quality. If, after welding, visual inspection reveals that a sound weld or a full 360-degree fillet has not been obtained for a particular stud, that stud shall be struck with a hammer and bent 15 degrees off perpendicular in the direction away from the missing weld. Studs failing test shall be replaced.

3.11 REINFORCING STEEL MECHANICAL SPLICES

- A. Inspection and Observation Services:
1. Visually inspect and report on completed condition of each mechanical splice of reinforcing steel.
 2. Visually inspect each mechanical splice to ensure compliance with the ICC-ES Reports and the manufacturer's published criteria for acceptable completed splices.
 3. Place special emphasis on the inspection of the end preparation of each bar to be spliced required by the ICC-ES Report.
- B. Reports:
1. Submit reports to Architect:
 - a. Copies of manufacturer's published criteria for acceptable completed splices prior to observing mechanical splices.
 - b. Reports on each mechanical splice shall indicate location of the splice, size of bars spliced, and acceptability or rejection of splice. Indicate reasons for rejection on each report.

3.12 OPEN WEB JOISTS AND JOIST GIRDERS

- A. Inspect joists at jobsite for compliance with specified fabrication requirements. Verify welded connections between web and chord, splices, and straightness of members.
- B. Inspect installation of joists at jobsite. Check connections to supporting members, chord extensions, number of rows of bridging, and bridging connections for compliance with Contract Documents and referenced standards.
- C. Verify welder qualification certificates for both shop and field welding operators.

3.13 METAL FLOOR DECK

- A. Field inspection shall consist of:
1. Verifying types, gauges, and finishes for compliance with Contract Documents and shop drawings.
 2. Examine composite floor deck exposed to crawl space for damage to galvanizing due to welding or construction activities. Repair galvanized composite floor deck in accordance with the Specifications.

3. Examine the erection of metal deck, fastenings, reinforcing of holes, deck reinforcing, miscellaneous deck supports, hanger tabs, shear studs, deck closures, painting, or other coating.
4. Certification of welders.
5. Inspect and test field welded shear studs used to fasten metal floor decking to supporting steel as specified for structural steel.

3.14 METAL ROOF DECK

- A. Field inspection shall consist of:
 1. Verify types, gauges, and finishes for compliance with Contract Documents and shop drawings.
 2. Examine the erection of the metal deck, including fastenings at supports and side laps, reinforcing of holes, and miscellaneous deck supports.
 3. Certification of welders.
 4. Visual inspection of at least 25 percent of welds.

3.15 SPRAYED FIREPROOFING

- A. Verify that applied thickness, density, and bond strength of sprayed fireproofing meets fire rating requirements of approved design.
- B. Verify that installation complies with fire rating requirements of approved design.
- C. Inspect and test for thickness:
 1. Test 25 percent of structural frame columns and beams in each building level.
 2. Test ten percent (10%) of beams other than structural frame in each building level.
 3. Test one (1) slab per 5,000 square feet of building area.
- D. Inspect and test in accordance procedures of ASTM E605 and ASTM E736.

3.16 EXPANSION BOLT INSTALLATION

- A. Inspect drilling of each hole and installation of each expansion bolt for compliance with Contract Documents and shop drawings.
- B. Verify installation torque for each expansion bolt for compliance with manufacturer's installation instructions.

3.17 LIGHTWEIGHT INSULATING CONCRETE FILL

- A. Inspection and Observation Services (As Required):
 1. Inspection of roof deck prior to start of Work.
 2. Inspection during installation of insulation and lightweight insulating concrete fill Work to ascertain compliance with Contract Documents.
 3. Observation of base ply fastener pull tests performed by Contractor to ascertain minimum withdrawal resistance of 40 pounds per fastener.
- B. Testing Services (As Required):
 1. References (as applicable for tests required):
 - a. American Society for Testing and Materials (ASTM):
 - 1) C177 - Standard Test Method for Steady State Heat Flux Measurements and Thermal Transmission Properties By Means of the Guarded Hot Plate Apparatus.

- 2) C495 - Test Method for Compressive Strength of Lightweight Insulating Concrete.
- 3) C578 - Specification for Rigid, Cellular Polystyrene Thermal Insulation.
2. Test EPS insulation board for thermal insulation value in accordance with ASTM C177.
3. Test lightweight insulating concrete fill in accordance with ASTM C495 for:
 - a. Mix design compressive strength.
 - b. Mix design wet and dry density range.
 - c. Number of Tests:
 - 1) One (1) per 5,000 square feet.
 - 2) Not less than one (1) for each day's Work.
4. Test EPS insulation board for density in accordance with ASTM C578.

3.18 TESTING OF ROOFING

- A. Inspection and Observation Services (As Required):
 1. Inspection of roof deck prior to start of Work.
 2. Inspect onsite condition of stored roofing materials.
 3. Inspection during roofing, roof insulation, and sheet metal Work to ascertain compliance with Contract Documents.
 4. Observation of roof test cuts performed by Contractor to ascertain that they are properly made.
 5. Observation of patching of roof test cuts to ascertain that they are properly made.
- B. Testing Services (As Required):
 1. Perform dissection and analysis on cuts provided by Contractor to confirm number of plies, bonding of plies, weight of bitumen and softening temperature to ascertain compliance with Specifications.

3.19 MASONRY

- A. Inspection and Observation Services:
 1. Inspection of placement of reinforcement including condition, grade, size, location, spacing, and lap splices.
 2. Review mortar design mixes.
 3. Inspection of laying, mortaring, and grouting of concrete masonry units and elements.
- B. Testing Services:
 1. References (as applicable for tests required):
 - a. ASTM International (ASTM):
 - 1) C140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units.
 - 2) C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
 - 3) C1019 - Standard Test Method for Sampling and Testing Grout.
 2. Testing of Concrete Masonry Units (CMU):
 - a. Pre-construction - Perform the following tests in accordance with ASTM C140:
 - 1) Compressive Strength.
 - 2) Absorption.
 - 3) Weight.
 - 4) Moisture Content.
 - 5) Dimensions.
 3. Mortar Tests:
 - a. Pre-construction - Perform the following tests in accordance with ASTM C780 on each type of mortar mix used on the Project:
 - 1) 28-day compressive strength.
 - 2) Water retention.

- b. Construction: Perform 28-day compressive strength test in accordance with ASTM C780 on each type of mortar mix used on the Project at the rate of one (1) test per 2,000 square feet of masonry.
4. Refer to and include Work for reinforcing steel specified.
5. Grout tests:
 - a. Pre-construction - Perform the following tests in accordance with ASTM C1019 on each type of grout mix used on the Project:
 - 1) Slump test.
 - 2) 28-Day compressive strength.
 - b. Construction: Perform 28-day compressive strength test in accordance with ASTM C1019 on each type of grout mix used on the Project at the rate of one (1) test per 2,000 square feet of masonry.
6. Prism test: Perform pre-construction 28-day compressive strength test on concrete masonry walls.

3.20 REPAIR AND PROTECTION

- A. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes:
 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 29: Cutting and Patching.
- B. Protect construction exposed by or for quality control service activities.
- C. Repair and protection are Contractor's responsibility regardless of the assignment of responsibility for quality control services.

END OF SECTION 01 45 23

SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities, including but not limited to:
 1. Water service and distribution.
 2. Sanitary facilities, including toilets, wash facilities, and drinking water facilities.
 3. Heating and cooling facilities.
 4. Ventilation.
 5. Electric power service.
 6. Lighting.
 7. Telephone service (land line)
 8. Waste disposal facilities.
 9. Field office.
 10. Storage and fabrication sheds.
 11. Lifts and hoists.
 12. Construction aids and miscellaneous services and facilities.
 13. Environmental protection.
 14. Pest control.
 15. Enclosure fence.
 16. Security enclosure and lockup.
 17. Barricades, warning signs, and lights.
 18. Temporary partitions.
 19. Fire protection.
 20. Accessories necessary for a complete installation.
 21. Temporary signage.
- B. Use Charges:
 1. Installation, removal of, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of the Project, testing agencies, and authorities having jurisdiction.
 2. Water and sewer service: Pay sewer service use charges for water used and sewer usage by all entities for construction operations.
 3. Electric power service: Pay electric power service use charges for electricity used by all entities for construction operations.

1.3 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Moisture Protection Plan:
 1. Describe procedures and controls for protecting materials and construction from water absorption and damage:

- a. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - b. Indicate procedures for discarding water damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged work.
 - c. Indicate sequencing of work that requires water, such as sprayed fire resistive materials, plastering, and tile grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- C. Dust and HVAC Control Plan:
1. Submit coordination drawing and narrative that indicates the dust and HVAC control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
 - a. HVAC system isolation schematic drawing.
 - b. Location of proposed air-filtration system discharge.
 - c. Waste handling procedures.
 - d. Other dust control measures.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. Accessible Temporary Egress:
 - a. Comply with 2022 California Building Code (CBC) CCR Title 24, Part 2, (as adopted and amended by DSA).
 - b. Comply with applicable provisions in the U.S. Architectural and Transportation Barriers Compliance Board ADA-ABA Accessibility Guidelines (ADAAG), ICC/ANSI A117.1.
- B. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- C. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.
- B. Chain Link Fencing: Minimum 2 inches (50 mm), 0.148-inch (3.8 mm) thick, galvanized steel, chain link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch (60 mm) OD line posts and 2-7/8 inch (73 mm) OD corner and pull posts.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, ten (10) mils (0.25 mm) minimum thickness, with flame spread rating of 15 or less per ASTM E84.
- D. Dust Control Adhesive Surface Walk-off Mats: Provide mats a minimum of 36 inches by 60 inches (914 mm x 1624 mm).

- E. Insulation: Unfaced mineral fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame spread and smoke developed indexes of 25 and 50, respectively.
- F. Lumber and Plywood: Comply with requirements in Sections 06 10 00: Rough Carpentry
- G. Gypsum Board: Minimum 1/2-inch (12.7 mm) thick by 48 inches (1219 mm) wide by maximum available lengths; Type X or Type C panels with tapered edges. Comply with Section 09 21 16: Gypsum Board Assemblies.
- H. Paint: Comply with requirements in Section 09 90 00: Painting and Coating.
- I. Tarpaulins: Fire resistive labeled with flame-spread rating of 15 or less.
- J. Water: Potable.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
 - 3. Drinking water and private toilet.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F
 - 6. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. Drinking Water: Containerized, tap dispenser, bottled water drinking water units, including paper cup supply. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 degrees F to 55 degrees F (7.2 degrees C to 12.7 degrees C).
- C. Electrical Outlets: Properly configured, NEMA polarized outlets to prevent insertion of 110V to 120V plugs into higher voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

- D. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.
- E. HVAC Equipment:
 - 1. Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid propane gas or fuel oil heaters with individual space thermostatic control:
 - a. Heating units: Listed and labeled for type of fuel being consumed by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
 - b. Permanent HVAC system: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction. Clean HVAC system as required in Section 01 77 00: Closeout Procedures and install new filter with MERV 11 or greater.
- F. Air Filtration Units: Primary and secondary HEPA filter equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

3.2 INSTALLATION

- A. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work:
 - 1. Locate facilities to limit site disturbance as specified in Section 01 10 00: Summary.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

- A. Install temporary service. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage:
 - 1. Provide temporary utilities to remove effluent lawfully:
 - a. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities:
 - 1. Provide temporary toilets, wash facilities, and drinking water for use of construction

- personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities:
- a. Disposable supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
 - b. Wash facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
- E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Isolation of Work Areas in Occupied Facilities:
1. Prevent dust, fumes, and odors from entering occupied areas:
 - a. Prior to commencing Work, isolate the HVAC system in area where Work is to be performed according to coordination drawings:
 - 1) Disconnect supply and return ductwork in Work area from HVAC systems servicing occupied areas.
 - 2) Maintain negative air pressure within Work area using HEPA equipped air filtration units, starting with commencement of temporary partition construction and continuing until removal of temporary partitions is complete.
 - b. Maintain dust partitions during the Work. Use vacuum collection attachments on dust producing equipment. Isolate limited Work within occupied areas using portable dust containment devices.
 - c. Perform daily construction cleanup and final cleanup using approved, HEPA filter equipped vacuum equipment.
- G. Ventilation and Humidity Control:
1. Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption:
 - a. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- H. Electric Power Service:
1. Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations. Install electric power service underground unless otherwise indicated:
 - a. Electric distribution - Provide receptacle outlets adequate for connection of power tools and equipment:
 - 1) Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length voltage ratio.
 - 2) Provide warning signs at power outlets other than 110 to 120-V.
 - 3) Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or traffic areas.
 - 4) Provide metal conduit enclosures or boxes for wiring devices.
 - 5) Provide four (4) gang outlets, spaced so 100-foot (30 m) extension cord can

reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.

- I. Lighting:
 - 1. Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions:
 - a. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - b. Install lighting for Project identification sign.

- J. Telephone Service:
 - 1. Provide temporary telephone service in common use facilities for use by construction personnel, Architect, and inspection services. Install a minimum of one (1) telephone line(s) for each field office:
 - a. Provide dedicated telephone line for each facsimile machine in each field office.
 - b. At each telephone, post a list of important telephone numbers:
 - 1) Police and fire departments.
 - 2) Ambulance service.
 - 3) Contractor's home office.
 - 4) Contractor's emergency after-hours telephone number.
 - 5) Architect's office.
 - 6) Engineers' offices.
 - 7) Owner's office.
 - 8) Principal subcontractors' field and home offices.
 - c. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

- K. Electronic Communication Service:
 - 1. Provide a desktop computer and printer/scanner in the primary field office adequate for use by Architect, inspection services, and Owner to access Project electronic documents and maintain electronic communications:
 - a. Internet service: Broadband modem, router, and ISP equipped with hardware firewall.
 - b. Internet security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
 - c. Backup: External hard drive, minimum one (1) terabyte, with automated backup software providing daily backups.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E136. Comply with NFPA 241:
 - 1. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities under conditions acceptable to Owner.

- B. Temporary Use of Permanent Roads and Paved Areas:
 - 1. Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations:
 - a. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.

- b. Prepare subgrade and install sub-base and base for temporary roads and paved areas.
 - c. Recondition base after temporary use, including removing contaminated material, regrading, proof rolling, compacting, and testing.
 - d. Delay installation of final course of permanent pavement until immediately before Substantial Completion.
- C. Traffic Controls:
- 1. Comply with requirements of authorities having jurisdiction:
 - a. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - b. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary parking areas for construction personnel.
- E. Dewatering Facilities and Drains:
- 1. Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water:
 - a. Dispose of rainwater in a lawful manner that will not result in flooding the Project or adjoining properties, or endanger permanent Work or temporary facilities.
- F. Project Signs: Not listed in 3.5 Below.
- 1. Provide Project signs as indicated. Unauthorized signs are not permitted:
 - a. Identification signs: Provide Project identification signs as indicated on Drawings.
 - b. Temporary signs:
 - 1) Provide other signs as indicated and as required to inform public and individuals seeking entrance to the Project:
 - a) Provide temporary, directional signs for construction personnel and visitors.
 - c. Maintain and touchup signs so they are legible at all times.
- G. Waste Disposal Facilities: Provide waste collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 73 00: Execution.
- H. Lifts and Hoists:
- 1. Provide facilities necessary for hoisting materials and personnel:
 - a. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- I. Temporary Elevator Use: Use of elevators is not permitted.
- J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- K. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SIGNS

- A. Furnish and install a project sign 6'-0" by 8'-0" in size. Image will be provided to the graphics printing company by the Architect after Award of Contract. Contractor will be responsible for the cost of printing the image, mounting the sign on an aluminum substrate and installing the sign at the site. The sign will include the name of the project, District,

name and title of Board of Trustees, District Superintendent, Contractor, Architect, and each of the project consultants.

- B. Other signs permitted at the site:
 - 1. Warning signs.
 - 2. Directional signs.
 - 3. Identification signs at field offices.
 - 4. Emergency medical services sign.
 - 5. Signs required by Authorities Having Jurisdiction
 - 6. Storm Water Pollution Prevention Plan sign (SWPPP)

- C. Contractor shall allow no other signs to be displayed at the project site, unless authorized by the Owner/District.

3.6 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of 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. Repair damage to existing facilities to the satisfaction of Owner and Architect.

- B. Environmental Protection:
 - 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. Temporary Erosion and Sedimentation Control:
 - 1. Provide measures to prevent soil erosion and discharge of soil bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of authorities having jurisdiction:
 - a. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree or plant protection zones.
 - b. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - c. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 - d. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

- D. Stormwater Control:
 - 1. Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

- E. Tree and Plant Protection:
 - 1. Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

- F. Pest Control:
 - 1. Engage pest control services to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

- G. Site Enclosure Fence:
 - 1. Before construction operations begin, provide site enclosure fence to prevent people and animals from easily entering site except by entrance gates:
 - a. Extent of fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
- H. Security Enclosure and Lockup:
 - 1. Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each Work day.
- I. Barricades, Warning Signs, and Lights:
 - 1. Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress:
 - 1. Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- K. Temporary Enclosures:
 - 1. Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather-tight enclosure for building exterior:
 - a. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- L. Temporary Partitions:
 - 1. Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate occupied areas from fumes and noise:
 - a. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side and fire retardant treated plywood on construction operations side.
 - b. Construct dustproof partitions with two layers of 6-mil (0.14 mm) polyethylene sheet on each side. Cover floor with two (2) layers of 6-mil (0.14 mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire retardant treated plywood. Do not apply tape to finish floor surfaces:
 - 1) Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches (1219 mm) between doors. Maintain water dampened foot mats in vestibule.
 - c. Where fire resistance rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 - d. Insulate partitions to control noise transmission to occupied areas.
 - e. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 - f. Protect air handling equipment.
 - g. Provide walk-off mats at each entrance through temporary partition.
- M. Temporary Fire Protection:
 - 1. Install and maintain temporary fire protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program:
 - a. Prohibit smoking in construction areas.
 - b. Supervise welding operations, combustion type, temporary heating units, and similar sources of fire ignition according to requirements of authorities having

- jurisdiction.
- c. Develop and supervise an overall fire prevention and protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - d. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.7 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture Protection Plan:
 1. Avoid trapping water in finished Work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase:
 1. Before installation of weather barriers, when materials are subject to wetting and exposure to airborne mold spores, protect as follows:
 - a. Protect porous materials from water damage.
 - b. Protect stored and installed material from flowing or standing water.
 - c. Keep porous and organic materials from coming into prolonged contact with concrete.
 - d. Remove standing water from decks.
 - e. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase:
 1. After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - a. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - b. Keep interior spaces reasonably clean and protected from water damage.
 - c. Periodically collect and remove waste containing cellulose or other organic matter.
 - d. Discard or replace water-damaged material.
 - e. Do not install material that is wet.
 - f. Discard, replace, or clean stored or installed material that begins to grow mold.
 - g. Perform Work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Condition Phase of Construction:
 1. After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - a. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - b. Use permanent HVAC system to control humidity.
 - c. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits and moisture control:
 - 1) Hygroscopic materials that may support mold growth, including wood and gypsum-based products, which become wet during the course of construction and remain wet for 48 hours are considered defective and are to be removed and replaced.
 - 2) Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in

- writing to Architect.
- 3) Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.8 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision:
 1. Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance:
 1. Maintain facilities in good operating condition until removal:
 - a. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover:
 1. Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion unless otherwise required and approved by Owner and Architect.
- D. Termination and Removal:
 1. Remove each temporary facility when need when its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired:
 - a. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - b. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 - c. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 22: Substantial Completion Procedures.

END OF SECTION 01 50 00

SECTION 01 55 26 TRAFFIC CONTROL

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. Work consists of furnishing traffic control devices and services for the control and protection of traffic through the area of construction in accordance with the Drawings and Specifications and in conformity with the details and at the locations shown on the approved plans for Temporary Traffic Control or as established by local ordinances and/or CalTrans Engineer.
- B. Safe Traffic Flow to and through the Project site shall be maintained at all times.
- C. Traffic control shall conform to CalTran's encroachment permit requirements or as designated by local ordinances.

1.3 SUBMITTALS

- A. Prior to beginning construction, Contractor shall apply for any and all traffic related permits and/or encroachments required by CalTrans or local jurisdictions. Provide detailed plans, indicating direction and placement of traffic altering devices, including advanced warning signage and detour signage required for Project. Temporary Traffic Control plan must be approved by Architect, subjected to CalTrans permitting prior to beginning construction activities.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

- A. There will be no interruption of traffic on adjacent and feeder roads to the residential and commercial usage by maintaining a minimum of one-way traffic.
- B. No construction shall begin until all traffic control signs and devices are installed by Contractor.

END OF SECTION 01 55 26

SECTION 01 60 00 PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products, including but not limited to:
 1. Product delivery, storage, and handling.
 2. Manufacturers' written warranties on products.
 3. Special warranties.
 4. Comparable products.

1.3 DEFINITIONS

- A. Basis of Design Product Specification:
 1. A Specification in which a specific manufacturer's product is named and accompanied by the words *basis of design*, including make, model number, or other designation to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the Specification.
- B. Products:
 1. Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term *product* includes the terms *material*, *equipment*, *system*, *assembly*, and terms of similar intent:
 - a. Named products: Items identified by manufacturer's product name, including make, model number, or other designation shown or listed in manufacturer's published product literature current as of date of the Contract Documents.
 - b. New products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - c. Comparable product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

1.4 SUBMITTALS

- A. Comparable Product Requests:
 1. Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title, and Drawing number(s) and title(s):
 - a. Include data to indicate compliance with the specified requirements.
 - b. Architect's action: If necessary, Architect will request additional information or documentation for evaluation within one (1) week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven (7) days

of receipt of additional information or documentation, whichever is later:

- 1) Form of Approval: As specified in Section 01 33 00: Submittal Procedures.
- 2) Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis of Design Product Specification Submittal:

1. Comply with requirements in Section 01 33 00: Submittal Procedures. Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options:

1. If Contractor is given option of selecting between two (2) or more products for use on Project, select a product compatible with products previously selected, even if previously selected products were also options:
 - a. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - b. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 WARRANTY

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents:

1. Manufacturer's warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Warranties:

1. Prepare a written document that contains appropriate terms and identification, ready for execution:
 - a. Specified form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 - b. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time:

1. Comply with requirements in Section 01 77 00: Closeout Procedures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original

sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to determine compliance with the Contract Documents, and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

PART 2 PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. Product Requirements:

1. Provide products that comply with the Contract Documents, are undamaged, and unless otherwise indicated, are new at time of installation:
 - a. Provide products complete with accessories, trim, finish, fasteners, and items needed for complete installation and indicated use and effect.
 - b. Standard products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - c. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - d. Where products are accompanied by the phrase *as selected*, Architect will make selection.
 - e. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

5. Basis of Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and characteristics based on the product named. Comply with requirements for consideration of an unnamed product by one of the named manufacturers.
- C. Visual Matching Specification:
1. Where Specifications require *match Architect's sample*, provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches:
 - a. If no product available within specified category matches and complies with specified requirements, comply with requirements of Section 01 25 00: Substitution Procedures and Form for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase *selected by Architect* or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration:
1. Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 - a. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - b. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - c. Evidence that proposed product provides specified warranty.
 - d. List of similar installations for completed projects with project names and addresses, and names and addresses of architects and owners, if requested.
 - e. Samples, if requested.

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 60 00

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 1. Construction layout.
 2. Field engineering and surveying.
 3. Installation of the Work.
 4. Coordination of Owner-installed products.
 5. Progress cleaning.
 6. Starting and adjusting.
 7. Protection of installed construction.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.
- B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- C. Certified Surveys: Submit two copies signed by land surveyor.
- D. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor legally qualified to practice in the State of California, who is experienced in providing land surveying services of the kind indicated.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
- B. In Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not warranted. Before beginning site Work, investigate and verify existence and location of underground utilities, mechanical and electrical systems, and construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water service piping; underground electrical services, and other utilities.
 - 2. Furnish location data for Work related to the Work that must be performed by public utilities serving the site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. Proceed with installation after correcting unsatisfactory conditions. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as necessary to locate each element of Project.
 - 2. Establish limits on use of site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical Work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control Work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.

- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other Work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage a land surveyor or professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. Locate the work and components of the work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal Work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions ensuring the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous. Materials containing asbestos and BCPs are prohibited.

3.6 OWNER INSTALLED PRODUCTS

- A. Site Access: Provide access to site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with Work performed by Owner's construction personnel.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's Work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

- A. Clean site and Work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 degrees F (27 degrees C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed Work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 00.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with mechanical, plumbing, and electrical requirements.
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

SECTION 01 73 29 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Procedural requirements for cutting and patching.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 2. Changes to In Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 3. Products: List products used for patching and firms or entities that will perform patching Work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.5 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
- B. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
- C. Operational Elements: Do not cut and patch operating elements and related components that results in reducing the capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - 1. Primary operational systems and equipment.
 - 2. Fire separation assemblies.

3. Air or smoke barriers.
 4. Fire suppression systems.
 5. Mechanical systems piping and ducts.
 6. Control systems.
 7. Communication systems.
 8. Fire-detection and -alarm systems.
 9. Conveying systems.
 10. Electrical wiring systems.
 11. Operating systems of special construction.
- D. Miscellaneous Elements: Do not cut and patch the following elements or related components that change the load bearing capacity, resulting in a reduction of capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
1. Water, moisture, or vapor barriers.
 2. Membranes and flashings.
 3. Exterior curtain wall construction.
 4. Equipment supports.
 5. Piping, ductwork, vessels, and equipment.
 6. Noise and vibration control elements and systems.
 7. Sprayed fire resistive material.
- E. Visual Requirements: Do not cut and patch construction resulting 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.
1. If possible, retain original Installer or fabricator to cut and patch exposed Work. If possible, engage original Installer or fabricator. If original installer is not available, engage recognized, experienced, and specialized firm for the Work.
 - a. Processed concrete finishes.
 - b. Ornamental metal.
 - c. Matched veneer woodwork.
 - d. Preformed metal panels.
 - e. Roofing.
 - f. Firestopping.
 - g. Window system.
 - h. Fluid applied flooring.
 - i. Wall covering.
 - j. HVAC enclosures, cabinets, or covers.
- F. Cutting and Patching Conference: Before proceeding, meet at site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with specified requirements.

- 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 removal, relocation, or abandonment is necessary, bypass existing services before cutting to avoid interruption of services to occupied areas.

3.3 CUTTING AND PATCHING

- A. Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at earliest feasible time, and complete without delay.
 - 1. Cut existing construction to provide for installation of components or performance of construction, and subsequently patch as necessary to restore surfaces to an original condition.
 - 2. Cut in place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of Work to be cut.
- C. Protection: Protect in place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in **Section 01 10 00.**

- E. 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. 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. Finished Surfaces: Cut or drill from exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable earthwork specifications 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.
- F. 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 to eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions are removed, extend one finished area into another, patch and repair surfaces in new space. Provide 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.
 4. 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.
 5. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
 6. Exterior Building Enclosure: Patch components and restore enclosure to a weathertight condition.

END OF SECTION 01 73 29

SECTION 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 1. Salvaging nonhazardous demolition and construction waste.
 2. Recycling nonhazardous demolition and construction waste.
 3. Disposing of nonhazardous demolition and construction waste.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Waste Management Plan: Submit plan within ten (10) days of date established for commencement of the Work.
- B. Waste Reduction Progress Reports:
 1. Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:
 - a. Material category.
 - b. Generation point of waste.
 - c. Total quantity of waste in tons (tonnes).
 - d. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
 - e. Quantity of waste recycled, both estimated and actual in tons (tonnes).
 - f. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
 - g. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

- C. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end of Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Firm having minimum ten (10) years of documented experience in specializing in waste management coordination.
- B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Waste Management Conference:
 - 1. Conduct conference at site. Review methods and procedures related to waste management including, but not limited to, the following:
 - a. Review and discuss waste management plan including responsibilities of waste management coordinator.
 - b. Review requirements for documenting quantities of each type of waste and its disposition.
 - c. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - d. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - e. Review waste management requirements for each trade.

1.6 PERFORMANCE REQUIREMENTS

- A. Conform to County regulations regarding Solid Waste Control.

- B. Achieve end of Project rates for salvage/recycling of 50 percent by weight of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials:
1. Demolition waste:
 - a. Asphalt paving.
 - b. Concrete.
 - c. Concrete reinforcing steel.
 - d. Brick.
 - e. Concrete masonry units.
 - f. Wood studs.
 - g. Wood joists.
 - h. Plywood and oriented strand board.
 - i. Wood paneling.
 - j. Wood trim.
 - k. Structural and miscellaneous steel.
 - l. Rough hardware.
 - m. Roofing.
 - n. Insulation.
 - o. Doors and frames.
 - p. Door hardware.
 - q. Windows.
 - r. Glazing.
 - s. Metal studs.
 - t. Gypsum board.
 - u. Acoustical tile and panels.
 - v. Carpet.
 - w. Carpet pad.
 - x. Demountable partitions.
 - y. Equipment.
 - z. Cabinets.
 - aa. Plumbing fixtures.
 - bb. Piping.
 - cc. Supports and hangers.
 - dd. Valves.
 - ee. Sprinklers.
 - ff. Mechanical equipment.
 - gg. Refrigerants.
 - hh. Electrical conduit.
 - ii. Copper wiring.
 - jj. Lighting fixtures.
 - kk. Lamps.
 - ll. Ballasts.
 - mm. Electrical devices.
 - nn. Switchgear and panelboards.
 - oo. Transformers.
 2. Construction waste:
 - a. Masonry and CMU.
 - b. Lumber.
 - c. Wood sheet materials.
 - d. Wood trim.
 - e. Metals.
 - f. Roofing.
 - g. Insulation.
 - h. Carpet and pad.

- i. Gypsum board.
- j. Piping.
- k. Electrical conduit.
- l. Packaging - Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.

1.7 WASTE MANAGEMENT PLAN

- A. Develop a waste management plan and requirements. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition site clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan:
 1. List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures:
 - a. Salvaged materials for reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - b. Salvaged materials for sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - c. Salvaged materials for donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - d. Recycled materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - e. Disposed materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - f. Handling and transportation procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- D. Cost/Revenue Analysis:
 1. Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:
 - a. Total quantity of waste.
 - b. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.

- c. Total cost of disposal (with no waste management).
- d. Revenue from salvaged materials.
- e. Revenue from recycled materials.
- f. Savings in hauling and tipping fees by donating materials.
- g. Savings in hauling and tipping fees that are avoided.
- h. Handling and transportation costs. Include cost of collection containers for each type of waste.
- i. Net additional cost or net savings from waste management plan.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 PLAN IMPLEMENTATION

- A. Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract:
 1. Comply with operation, termination, and removal requirements in Section 01 50 00: Temporary Facilities and Controls.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training:
 1. Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work:
 - a. Distribute waste management plan to everyone concerned within three (3) days of submittal return.
 - b. Distribute waste management plan to entities when they first begin work onsite. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls:
 1. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities:
 - a. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - b. Comply with Section 01 50 00: Temporary Facilities and Controls for the control of dust and dirt, environmental protection, and noise control.
- E. Waste Management in Historic Zones or Areas: Hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, by 12 inches (300 mm) or more.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work:
 1. Salvage items for reuse and handle:
 - a. Clean salvaged items.
 - b. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - c. Store items in a secure area until installation.

- d. Protect items from damage during transport and storage.
 - e. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use:
- 1. Salvage items for Owner's use and handle as follows:
 - a. Clean salvaged items.
 - b. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - c. Store items in a secure area until delivery to Owner.
 - d. Transport items to Owner's storage area designated by Owner.
 - e. Protect items from damage during transport and storage.
- D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors, unless otherwise designated by Owner.
- E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- F. Plumbing Fixtures: Separate by type and size.
- G. Lighting Fixtures: Separate lamps by type and protect from breakage.
- H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING WASTE

- A. Recycle paper and beverage containers used by onsite workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures:
- 1. Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan:
 - a. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin:
 - 1) Inspect containers and bins for contamination and remove contaminated materials if found.
 - b. Stockpile processed materials onsite without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - c. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - d. Store components off the ground and protect from the weather.

- e. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 DISPOSAL OF WASTE

- A. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction:
 1. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate onsite.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning:
 1. Do not burn waste materials:
 - a. Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.
- C. Disposal: Remove waste materials and dispose of at designated spoil areas on Owner's property.

3.5 ATTACHMENTS

- A. Form CWM-1 for construction waste identification.
- B. Form CWM-2 for demolition waste identification.
- C. Form CWM-3 for construction waste reduction work plan.
- D. Form CWM-4 for demolition waste reduction work plan.
- E. Form CWM-5 cost/revenue analysis of construction waste reduction work plan.
- F. Form CWM-6 cost/revenue analysis of demolition waste reduction work plan.
- G. Form CWM-7 for construction waste
- H. Form CWM-8 for demolition waste.

CWM FORMS ON FOLLOWING PAGES

FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION							
MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED* (A)	EST. WASTE - % (B)	TOTAL EST. QUANTITY OF WASTE* (C = A x B)	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							

FORM CWM-2: DEMOLITION WASTE IDENTIFICATION				
MATERIAL DESCRIPTION	EST. QUANTITY	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Asphaltic Concrete Paving				
Concrete				
Brick				
CMU				
Lumber				
Plywood and OSB				
Wood Paneling				
Wood Trim				
Miscellaneous Metals				
Structural Steel				
Rough Hardware				
Insulation				
Roofing				
Doors and Frames				
Door Hardware				
Windows				
Glazing				
Acoustical Tile				
Carpet				
Carpet Pad				
Demountable Partitions				
Equipment				
Cabinets				
Plumbing Fixtures				
Piping				
Piping Supports and Hangers				
Valves				
Sprinklers				
Mechanical Equipment				
Electrical Conduit				
Copper Wiring				
Light Fixtures				
Lamps				
Lighting Ballasts				
Electrical Devices				
Switchgear and Panelboards				
Transformers				
Other:				

FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						
Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						
Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

FORM CWM-4: DEMOLITION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Asphaltic Concrete Paving						
Concrete						
Brick						
CMU						
Lumber						
Plywood and OSB						
Wood Paneling						
Wood Trim						
Miscellaneous Metals						
Structural Steel						
Rough Hardware						
Insulation						
Roofing						
Doors and Frames						
Door Hardware						
Windows						
Glazing						
Acoustical Tile						
Carpet						
Carpet Pad						
Demountable Partitions						
Equipment						
Cabinets						
Plumbing Fixtures						
Piping						
Supports and Hangers						
Valves						
Sprinklers						
Mechanical Equipment						
Electrical Conduit						
Copper Wiring						
Light Fixtures						
Lamps						
Lighting Ballasts						
Electrical Devices						
Switchgear and Panelboards						
Transformers						
Other:						

FORM CWM-5: COST/REVENUE ANALYSIS OF CONSTRUCTION WASTE REDUCTION WORK PLAN								
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-6: COST/REVENUE ANALYSIS OF DEMOLITION WASTE REDUCTION WORK PLAN								
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mech. Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								
Other:								

FORM CWM-7: CONSTRUCTION WASTE REDUCTION PROGRESS REPORT								
MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-8: DEMOLITION WASTE REDUCTION PROGRESS REPORT								
MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mechanical Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								
Other:								

END OF SECTION 01 74 19

SECTION 01 77 10 DSA PROJECT CLOSEOUT AND CERTIFICATION PROCESS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 01 31 00: Project Management and Coordination.
 - 2. Section 01 32 10: Preconstruction Conference Notes
 - 3. Section 01 42 00: References.
 - 4. Section 01 73 00: Execution.
 - 5. **Section 01 77 00: Closeout Procedures** (Including forms A, B, C, and D)
 - 6. Section 01 77 22: Substantial Completion Procedures.

1.2 PRE-CONSTRUCTION

- A. DSA Documents Required:
 - 1. **SSS 103 Form** to provide DSA and General Contractor with a Structural Testing and Inspections list (T&I).
 - 2. **DSA Form 5** is to be filled out for District to select a Project Inspector (P.I.) to be hired for the particular project type (Class 1, 2 or 3) required. This Project Inspector must be interviewed and approved by the Architect of Record & Structural Engineer of Record. The Project Inspector and Special Testing Laboratory must be DSA Approved.
 - 3. **Pre-Construction Meeting** will be conducted by the Design Professional. Use standard PBK Pre-Con Sheet and customize for your project. Identify and discuss regulatory responsibilities of Design Professionals, Project Inspector, Testing Lab, General Contractor, the District and DSA.
 - 4. **Provide Documents** such as DSA Approved Plans & Specs, Soils Reports, Hazard Material Report, Addendums and any Material/Color Boards to the General Contractor and Project Inspector.
 - 5. **DSA Approvals.** The Design Professionals responsibility to obtain timely DSA Approval of all Addendums, Construction Change Directives and any changes to the approved Construction Documents. These changes can be a CCD "A" or a CCD "B" to be filled out on the DSA 140 Form. CCD "A" is work that effects changes to Structural Safety, Fire Life Safety or Access Compliance. CCD "B" is all other work that will make DSA aware of other important changes but do not affect Structural Safety, Fire Life Safety or Access Compliance. (Simple color of paint or floor finish, cabinet finishes for example are not to be submitted). Deferred Approvals by DSA will be the responsibility of the General Contractor.
 - 6. **Submit DSA Form 102** for Construction Start Notice and Inspection Card Request. This form will include Notice of Construction Start Date, information on the School District, Scope of Work, Listing of Project Participants (Design Professionals, Project Inspector, In-Plant Inspector if any, General Contractor, Laboratory of Record, Geotechnical Engineer, Project Delivery Method, Collaborators for DSA Box Type of Access granted.

1.3 CONSTRUCTION

- A. Project Review:
 - 1. **Project Inspector** shall provide continuous inspection during construction, provide daily and semi-monthly reports of progress of the scope of work to the District, the

- Design Professionals and DSA. Participate in resolutions for questions from the contractor and report the status of DSA Field Trip Note issues. Provide a current written record of all work inspected and monitor testing and special inspections required. The Project Inspector will notify contractor of any defective work or deviation from the DSA Approved Plans. If this work is not corrected a Deviation Notice will be issued by the P.I. This can sometimes require the Design Professionals to issue a CCD to DSA for Approval of additional or amended construction documents.
2. **Design Professional** shall observe the construction, obtain deviations from the approved documents by means of COs, CCDs, RFIs, PCOs, ASIs, etc. Resolve DSA Field Trip Note issues.
 3. **General Contractors** shall construct the project per the approved plans, timely corrections of Deviations noted by the Project Inspector or Design Professionals and timely submission of Deferred Approvals.
 4. **Testing Laboratory** shall provide material testing and special inspections, submit all materials testing and special inspections reports to DSA, Design Professional, Structural Engineer, and Project Inspector.

1.4 CLOSE OUT & CERTIFICATION

- A. Project Closeout:
1. Contractor shall notify the Design Professional & the District when they are completed enough to have a Punch Walk conducted. After the Punch List items have been completed the contractor shall notify the Design Professionals for issuance of a Notice of Substantial Completion that will start the warranty process for work completed.
 2. **Certification is a letter** issued by DSA Certifying that the building project has been completed in accordance with requirements as to the safety and design of the Education Code sections 17280-17316 and 81130-81147. Without Certification the School Board has liability for an future damage to public safety and DSA will be unable to approve plans affecting uncertified construction at any time in the future.
 3. **Closing document** should be obtained and submitted to DSA as soon as they become obtainable. Close out is initiated by the DSA Field Engineer. DSA will issue a 90 Day Letter requesting outstanding documents or unresolved issued that are required. All these need to be resolved prior to DSA issuing letter of certification.
 4. **District responsibilities** include issuing Notice of Completion and submit fee to DSA invoices. DSA Form 168 for final cost of construction and submit to DSA.
 5. **Design Professionals responsibilities** include resolving any outstanding issues related to the DSA 90 Day Letter, and submit a Verified Report DSA Form 6A/E.
 6. **Contractors & Project Inspectors responsibilities** include submit Verified Report DSA Form 6.
 7. **Laboratories responsibilities** include submit Lab Verified Report DSA Form 291, Special Inspection Verified Report DSA Form 292, and submit Geotechnical Verified Report DSA Form 293.

END OF SECTION 01 77 10

This is the Interior Punch List All items on this Punch List should be corrected by _____ (date).

INTERIOR PUNCH LIST FORM

NOTE TO ARCHITECT: Circle Number next to Item to be corrected.

NOTE TO PERSON CORRECTING WORK: Initial Blank next to Circled Number after work is corrected.

DATE: _____

ROOM NO. _____

BLDG. _____

JOB NAME: _____

DOORS/RAMPS/HARDWARE

- _____ 1. Adjust Closer
- _____ 2. Adjust Strike Plate
- _____ 3. Repair Damaged Plastic Laminate
- _____ 4. Install Silencers
- _____ 5. Repair Dent in Hollow Metal Frame
- _____ 6. Sand Corner Welds
- _____ 7. Door/Frame Not Labeled
- _____ 8. _____
- _____ 9. _____

PAINT & VINYL WALL COVERING

- _____ 1. Repair VWC @ N E S W wall
- _____ 2. Repair VWC @ N E S W wall
- _____ 3. Touch up Paint @ N E S W wall
- _____ 4. Touch up Door Frame
- _____ 5. Caulk Door Frame
- _____ 6. Clean & Paint Door Jamb Return @ L/R Side
- _____ 7. Clean Glue from Wall Mold
- _____ 8. _____
- _____ 9. _____

WINDOWS

- _____ 1. Adjusted Blinds
- _____ 2. Caulk
- _____ 3. Not Closing Properly, Correct
- _____ 4. Clean VWC Blue Off Window Frame
- _____ 5. _____

TOILET ACCESSORIES

- _____ 1. Install
- _____ 2. _____
- _____ 3. _____
- _____ 4. _____

DRYWALL

- _____ 1. Repair Nick on N E S W Wall
- _____ 2. Clean D.W. Mud Off Door Frame
- _____ 3. Refinish @ _____
- _____ 4. Screw Popping Out @ _____
- _____ 5. _____
- _____ 6. _____

CASEWORK AND MILLWORK

- _____ 1. Adjust Door @ _____
- _____ 2. Adjust Drawer @ _____
- _____ 3. Caulk _____
- _____ 4. Install Shelves @ Base/Wall Cabinet
- _____ 5. Install Finisher Washer on Screws
- _____ 6. Repair Damaged Laminate @ _____
- _____ 7. Seam Fill & Repair Seam in Countertops
- _____ 8. _____

CERAMIC & QUARRY TILE

- _____ 1. Repair Damaged Tile @ _____
- _____ 2. Caulk Window Sill
- _____ 3. _____
- _____ 4. _____
- _____ 5. _____

MECHANICAL

- _____ 1. _____
- _____ 2. _____
- _____ 3. _____
- _____ 4. _____

ACOUSTICAL CEILINGS

- _____ 1. Repair Damaged Tile @ _____
- _____ 2. Adjust Tile @ Sprinkler Head
- _____ 3. Adjust Tile @ Diffuser
- _____ 4. Install Missing Tile
- _____ 5. Repair Damaged Grid @ _____
- _____ 6. Rework Inside Corner
- _____ 7. Rework Outside Corner
- _____ 8. _____

ELECTRICAL

- _____ 1. Clean Light Lens
- _____ 2. Level Cover Plate @ N E S W wall
- _____ 3. _____
- _____ 4. _____

PLUMBING

- _____ 1. Tighten Drain Escutcheon
- _____ 2. _____
- _____ 3. _____
- _____ 4. _____

CARPET/FLOORING/BASE

- _____ 1. Clean Base Glue off N E S W Wall
- _____ 2. Straighten Base @ _____
- _____ 3. Repair Loose Base @ _____
- _____ 4. _____

MISCELLANEOUS

END OF SECTION 01 77 16

SECTION 01 77 22 SUBSTANTIAL COMPLETION PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, Substantial Completion procedures.
- B. Related Sections:
 - 1. Section 00 00 49: Certificate of Substantial Completion.
 - 2. Section 01 77 00: Closeout Procedures.

1.3 SUBMITTALS

- A. Contractor's List of Incomplete Items (Punch List): Initial submittal at Substantial Completion.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion:
 - 1. Minimum of ten (10) days prior to requesting an inspection for determining date of Substantial Completion. List items that are incomplete at time of request:
 - a. Certificates of release: Obtain and submit releases from all (i.e. city, county, authorities) authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - b. Submit closeout submittals, including Project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - c. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - d. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable:
 - 1) List of extra materials: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
 - e. Submit test/adjust/balance records from Owner vendor.
 - f. Submit changeover information related to Owner's occupancy, use, operation, and

maintenance.

- C. Procedures Prior to Substantial Completion:
1. A minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion, submit list items that are incomplete at time of request:
 - a. Advise Owner of pending insurance changeover requirements.
 - b. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - c. Complete startup and testing of systems and equipment.
 - d. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - e. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings as applicable.
 - f. Advise Owner of changeover in heat and utilities.
 - g. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - h. Terminate and remove temporary facilities from site, including mockups, construction tools, and similar elements, and restore or configure area to required or original condition.
 - i. Complete final cleaning requirements, including touchup painting.
 - j. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
 - k. Conditional lien regulations.
- D. Inspection:
1. Submit written request for inspection to determine Substantial Completion a minimum of ten (10) days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued:
 - a. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - b. Results of completed inspection will form the basis of requirements for final completion.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 FINAL CLEANING

- A. Perform Final Cleaning:
1. Conduct cleaning and waste-removal operations to comply with local laws and ordinances, and Federal and local environmental and antipollution regulations.
 2. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions:
 - a. Complete cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project. Cleaning activities include but are not limited to:
 - 1) Clean site, yard, and grounds, in areas disturbed by construction activities,

- including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
- 2) Sweep paved areas broom clean. Remove petrochemical spills, stains, and foreign deposits.
 - 3) Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - 4) Remove tools, construction equipment, machinery, and surplus material from Project site.
 - 5) Remove snow and ice to provide safe access to building.
 - 6) Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - 7) Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - 8) Sweep concrete floors broom clean in unoccupied spaces.
 - 9) Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - 10) Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - 11) Remove labels that are not permanent.
 - 12) Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - 13) Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - 14) Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - 15) Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection:
 - a) Clean HVAC system in compliance with NADCA Standard ACR 2013. Provide written report on completion of cleaning.
 - 16) Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - 17) Leave Project clean and ready for occupancy.
- B. Pest Control:
1. Comply with pest control requirements in Section 01 57 15: Integrated Pest Management. Prepare written report.
- C. Construction Waste Disposal:
1. Comply with waste disposal requirements.

END OF SECTION 01 77 22

SECTION 01 78 23 OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 1. Operation and maintenance documentation directory manuals.
 2. Emergency manuals.
 3. Systems and equipment operation manuals.
 4. Systems and equipment maintenance manuals.
 5. Product maintenance manuals.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section:
 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format:
 1. Submit operation and maintenance manuals in the following format:
 - a. Submit on digital media acceptable to Architect or by uploading to web-based project software site or by email to Architect. Enable reviewer comments on draft submittals.
 - b. Submit three (3) paper copies. Architect will return two (2) copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal:
 1. Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments:
 - a. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of

receipt of Architect's comments and prior to commencing demonstration and training.

- E. Comply with **Section 01 77 00: Closeout Procedures** for schedule for submitting operation and maintenance documentation. **Where applicable use 01 91 13: General Commissioning Requirements.**

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files:
1. Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required:
 - a. Electronic files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - b. File names and bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy:
1. Submit manuals in the form of hard-copy, bound and labeled volumes:
 - a. Binders:
 - 1) Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2 by 11-inch (215 mm X 280 mm) paper, with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets:
 - a) If two (2) or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b) Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
 - b. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project manual.
 - c. Protective plastic sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
 - d. Supplementary text: Prepared on 8-1/2 by 11-inch (215 mm X 280 mm) white bond paper.
 - e. Drawings:
 - 1) Attach reinforced, punched binder tabs on Drawings and bind with text:
 - a) If oversize Drawings are necessary, fold Drawings to same size as text pages and use as foldouts.
 - b) If Drawings are too large to be used as foldouts, fold and place Drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating Drawing titles, descriptions of contents, and Drawing locations.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals:
 - 1. Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - a. Title page.
 - b. Table of contents.
 - c. Manual contents.
- B. Title Page:
 - 1. Include the following information:
 - a. Subject matter included in manual.
 - b. Name and address of Project.
 - c. Name and address of Owner.
 - d. Date of submittal.
 - e. Name and contact information for Contractor.
 - f. Name and contact information for Construction Manager.
 - g. Name and contact information for Architect.
 - h. Name and contact information for commissioning authority.
 - i. Names and contact information for major consultants to Architect that designed the systems contained in the manuals.
 - j. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents:
 - 1. List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual:
 - a. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory:
 - 1. Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
 - a. List of systems and subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
 - b. List of equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
 - c. Tables of contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content:
 - 1. Organize manual into a separate section for each of the following:
 - a. Type of emergency.
 - b. Emergency instructions.
 - c. Emergency procedures.
- C. Type of Emergency:
 - 1. Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - a. Fire.
 - b. Flood.
 - c. Gas leak.
 - d. Water leak.
 - e. Power failure.
 - f. Water outage.
 - g. System, subsystem, or equipment failure.
 - h. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures:
 - 1. Include the following, as applicable:
 - a. Instructions on stopping.
 - b. Shutdown instructions for each type of emergency.
 - c. Operating instructions for conditions outside normal operating limits.
 - d. Required sequences for electric or electronic systems.
 - e. Special operating instructions and procedures.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual:
 - 1. Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures:
 - a. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - b. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content:
 - 1. In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - a. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 - b. Performance and design criteria if Contractor has delegated design responsibility.
 - c. Operating standards.

- d. Operating procedures.
 - e. Operating logs.
 - f. Wiring diagrams.
 - g. Control diagrams.
 - h. Piped system diagrams.
 - i. Precautions against improper use.
 - j. License requirements including inspection and renewal dates.
- C. Descriptions:
- 1. Include the following:
 - a. Product name and model number. Use designations for products indicated on Contract Documents.
 - b. Manufacturer's name.
 - c. Equipment identification with serial number of each component.
 - d. Equipment function.
 - e. Operating characteristics.
 - f. Limiting conditions.
 - g. Performance curves.
 - h. Engineering data and tests.
 - i. Complete nomenclature and number of replacement parts.
- D. Operating Procedures:
- 1. Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Instructions on stopping.
 - f. Normal shutdown instructions.
 - g. Seasonal and weekend operating instructions.
 - h. Required sequences for electric or electronic systems.
 - i. Special operating instructions and procedures.
- E. Systems and Equipment Controls: Describe the sequence of operation and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed and identify color coding where required for identification.

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals:
- 1. Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information:
 - a. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - b. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project manual and Drawing or schedule designation or identifier where applicable.

- D. Manufacturers' Maintenance Documentation:
 - 1. Include the following information for each component part or piece of equipment:
 - a. Standard maintenance instructions and bulletins:
 - 1) Include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one (1) item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable:
 - a) Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 - b. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - c. Identification and nomenclature of parts and components.
 - d. List of items recommended to be stocked as spare parts.

- E. Maintenance Procedures:
 - 1. Include the following information and items that detail essential maintenance procedures:
 - a. Test and inspection instructions.
 - b. Troubleshooting guide.
 - c. Precautions against improper maintenance.
 - d. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - e. Aligning, adjusting, and checking instructions.
 - f. Demonstration and training video recording, if available.

- F. Maintenance and Service Schedules:
 - 1. Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment:
 - a. Scheduled maintenance and service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - b. Maintenance and service record: Include manufacturers' forms for recording maintenance.

- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

- I. Warranties and Bonds:
 - 1. Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds:
 - a. Include procedures to follow and required notifications for warranty claims.

- J. Drawings:
 - 1. Prepare Drawings supplementing manufacturers' printed data to illustrate the

relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these Drawings with information contained in record Drawings to ensure correct illustration of completed installation:

- a. Do not use original Project record documents as part of maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project manual and Drawing or schedule designation or identifier where applicable.
- D. Product Information:
 1. Include the following, as applicable:
 - a. Product name and model number.
 - b. Manufacturer's name.
 - c. Color, pattern, and texture.
 - d. Material and chemical composition.
 - e. Reordering information for specially manufactured products.
- E. Maintenance Procedures:
 1. Include manufacturer's written recommendations and the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Schedule for routine cleaning and maintenance.
 - e. Schedule for annual inspection and reports.
 - f. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. Warranties and Bonds:
 1. Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds:
 - a. Include procedures to follow and required notifications for warranty claims.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 78 23

SECTION 01 78 39 PROJECT RECORD 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. Section includes administrative and procedural requirements for Project record documents, including but not limited to:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product data.
 - 4. Miscellaneous record submittals.

1.3 SUBMITTALS

- A. Record Drawings:
 - 1. Number of copies - Submit one (1) set of marked up record prints.
 - 2. Number of Copies - Submit copies of record Drawings:
 - a. Initial submittal:
 - 1) Submit PDF electronic files of scanned record prints and one (1) of file prints.
 - 2) Submit record digital data files and one (1) set of plots.
 - 3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final submittal:
 - 1) Submit PDF electronic files of scanned record prints and three (3) sets of prints.
 - 2) Submit record digital data files and three (3) sets of record digital data file plots.
 - 3) Plot each Drawing file, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit one (1) paper copy and one (1) annotated PDF electronic files of the Project Specifications, including addenda and Contract modifications.
- C. Record Product Data:
 - 1. Submit one (1) paper copy and one (1) annotated PDF electronic file and directories of each submittal:
 - a. Where record product data are required as part of operation and maintenance manuals, submit duplicate marked up product data as a component of manual.
- D. Miscellaneous Record Submittals: Refer to the individual Specification Sections for miscellaneous record keeping requirements and submittals in connection with various construction activities. Submit one (1) paper copy and annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report monthly indicating items incorporated into Project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 PROJECT RECORD DOCUMENT PROCEDURES

- A. Do not use Project record documents for construction purposes. Protect Project record documents from deterioration and loss. Provide access to Project record documents for Architect's reference:
 - 1. **Do not use** as-built Drawings and Specifications for record Drawings and Specifications.
- B. Recording Procedures: Update Drawings and Specifications on daily bases to record actual conditions. Record information concurrently with construction progress. Do not conceal work until required information is accurately recorded.
- C. Store record documents and samples apart from as-built documents used for construction:
 - 1. Label and file record documents and samples in accordance with Section number listings in table of contents. Label each document **PROJECT RECORD** in neat, large, printed letters.
 - 2. Maintain record documents in clean, dry, and legible condition.
 - 3. Make record documents and samples available for inspection upon request of Architect.

PART 2 PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints:
 - 1. Maintain one (1) set of marked up paper copies of the Contract Drawings and shop drawings:
 - a. Preparation:
 - 1) 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. Show actual installation conditions where installation varies from that shown originally:
 - a) Give attention to information on concealed elements 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.
 - e) Cross reference record prints to corresponding shop drawings or archive photographic documentation.
 - 2. Content:
 - a. Types of items requiring marking include, but are not limited to, the following:
 - 1) Dimensional changes to Drawings.
 - 2) Revisions to details shown on Drawings.
 - 3) Depths of foundations below first floor.
 - 4) Locations and depths of underground utilities.
 - 5) Revisions to routing of piping and conduits.
 - 6) Revisions to electrical circuitry.
 - 7) Actual equipment locations.
 - 8) Duct size and routing.
 - 9) Locations of concealed internal utilities.
 - 10) Changes made by Change Order or Construction Change Directive.
 - 11) Changes made following Architect's written orders.
 - 12) Details not on the original Contract Drawings.

- 13) Field records for variable and concealed conditions.
 - 14) Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and shop drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked up record prints.
 4. Mark record sets with erasable, red colored pencil. Use colors to distinguish between changes for different categories of the work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files:
1. Immediately before inspection for Certificate of Substantial Completion, review marked up record prints with Architect. When authorized, prepare full set of corrected digital data files of the Contract Drawings:
 - a. Format: Same digital data software program, version, and operating system as the original Contract Drawings and annotated PDF electronic file with comment function enabled.
 - b. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 - c. Refer instances of uncertainty to Architect for resolution.
 - d. Architect will furnish Contractor one (1) set of digital data files of the Contract Drawings for use in recording information:
 - 1) Refer to Section 01 33 00: Submittal Procedures for requirements related to use of Architect's digital data files.
 - 2) Architect will provide data file layer information. Record markups in separate layers.
- C. Newly Prepared Record Drawings:
1. Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor shop drawings are suitable to show actual installation:
 - a. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or modification. Including ALL documents used for Construction Change Directive to DSA.
 - b. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- D. Format:
1. Identify and date each record Drawing; include the designation **PROJECT RECORD DRAWING** in a prominent location:
 - a. Record prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - b. Format: Annotated PDF electronic file with comment function enabled.
 - c. Record digital data files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 - d. Identification:
 - 1) As follows:
 - a) Project name.
 - b) Date.
 - c) Designation PROJECT RECORD DRAWINGS.

- d) Name of Architect.
- e) Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation:
 - 1. 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 Change Orders, record product data, and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file and marked up paper copy of Specifications. ALL documents to match PBK format.

2.3 RECORD PRODUCT DATA

- A. Preparation:
 - 1. Mark product data to indicate the actual product installation where installation varies substantially from that indicated in product data submittal:
 - a. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - b. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - c. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record product data as annotated PDF electronic file. Include record product data directory organized by Specification Section number and title, electronically linked to each item of record product data.

2.4 RECORD SAMPLES

- A. Record Samples: Determine with Architect and Owner which submitted samples are to be maintained as record samples. Maintain and mark one (1) set to indicate date of review and approval by Architect; note any deviations or variations between reviewed sample and installed product or material.

2.5 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by the individual Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference. Include the following:
 - 1. Reviewed shop drawings, product data, and samples.
 - 2. Field test reports.
 - 3. Inspection certificates and manufacturer's certificates.

4. Inspections by authorities having jurisdiction (AHJ [DSA]).
 5. Documentation of foundation depths.
 6. Special measurements or adjustments.
 7. Tests and inspections.
 8. Surveys.
 9. Design mixes.
 10. DSA submitted CCDs.
- B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked up miscellaneous record submittals. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one (1) copy of each submittal during the construction period for Project record document purposes. Post changes and revisions to Project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and samples in the field office apart from the Contract Documents used for construction. Do not use Project record documents for construction. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project record documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 1. Demolition and removal of selected site elements.
 2. Salvage of existing items to be reused or recycled.
 3. Accessories necessary for demolition and deconstruction.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose offsite unless indicated as salvaged or reinstallation.
- B. Remove and Salvage: As indicated on drawings, detach items from existing construction with care to prevent damage, and deliver salvaged material to a location designated by the District. Contractor shall be responsible for materials, fittings, fixtures, etc., and shall use the utmost care in their removal, so as to insure the least possible damage to the same or surrounding work.
- C. Remove and Reinstall: Detach items from existing construction with care to prevent damage, clean and refurbish, prepare for reuse, store as necessary, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not scheduled for salvage or reuse, as is; do not remove.
- E. Deconstruct: To remove by disassembling or detaching an item from a surface, using methods and equipment to successfully prevent damage to the item and surfaces; and dispose of items unless indicated as salvaged or for reinstallation.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 SUBMITTALS

- A. Qualification Data: Submit copies of qualifications for refrigerant recovery technician.
- B. Proposed Protection Measures: Submit report, including Drawings, indicating proposed measures for protecting individuals and property, for environmental protection, dust control and noise control. Indicate proposed locations, types, and construction of barriers.
- C. Schedule of Selective Demolition Activities:
 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of elevator and stairs.

5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Inventory: Submit a list of items for removal and salvage and deliver to Owner prior to start of demolition.
- E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces that could be construed as damage caused by demolition operations. Submit prior to commencement of the work.
- F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 QUALITY ASSURANCE

- A. Owner Requirements: Coordinate with recommendations of the designated District environmental consultants for abatement of hazardous materials including: Asbestos, lead, other hazardous materials including; PCBs in transformers, fluorescent lamp recycle/disposal, radon abatement, and lead paint removal, VCT, TSI, etcetera.
- B. Regulatory Requirements:
 1. Demolition Standards: Comply with ASSE A10.6 and NFPA 241.
 2. Comply with EPA regulations prior to commencement of the work. Comply with hauling and disposal regulations of authorities having jurisdiction.
 3. Comply with applicable federal, state, and local codes for demolition work, dust and noise control, safety of structure, and debris removal.
 4. Obtain required permits from authorities having jurisdiction.
- C. Refrigerant Recovery Technician Qualifications: Certified by an EPA approved certification program.
- D. Predemolition Conference: Conduct conference at the site.
 1. Inspect and discuss condition of construction to be selectively demolished.
 2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 4. Review areas where existing construction is to remain and requires protection.

1.7 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide minimum of 72 hours' notice to Owner of demolition activities that will affect Owner's operations including but not limited to:
 1. Interruption of power.
 2. Interruption of utility services.
 3. Excessive noise.
- B. Condition of Structure: Conditions existing at time of inspection will be maintained by Owner as far as practical. Owner assumes no responsibility for actual condition of items or structures to be demolished.
 1. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
 2. Before commencing selective demolition, Owner will remove all loose items not permanently attached to the existing building(s) or structure(s).

- C. Hazardous Materials:
 - 1. Hazardous materials shall be removed by the Contractor based on the hazardous materials report provided by the Owner and under the supervision of the Owners hazardous materials consultant.
 - 2. Any item listed I the report as “assumed to be asbestos containing” shall be treated as if they are asbestos containing and need to be abated.
 - 3. If additional hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.

- D. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by at least 12 inches (300 mm).

- E. Storage or sale of removed items or materials on site is not permitted.

- F. Traffic: Conduct operations and debris removal to ensure minimum interference with roads, streets, drives, fire lanes, walks, accessible paths, and adjacent occupied or used facilities.
 - 1. Do not close, block, or obstruct streets, drives, walks, or occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around obstructed traffic ways.

- G. Explosives: Explosives are not permitted at the site.

- H. Flame Cutting: Do not use cutting torches for removal until flammable materials are removed. At concealed spaces, verify conditions prior to flame cutting operations. Maintain portable fire suppression devices during flame cutting operations.

- I. Environmental Controls: Use water sprinkling, temporary enclosures, or other acceptable methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection. Do not use water when it may create hazardous or objectionable conditions.

- J. Utility Services: Maintain existing utilities and protect against damage during demolition operations.
 - 1. Do not interrupt utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, acceptable to Owner and governing authorities.

- K. Protections: Provide temporary barriers to protect Owner's personnel and public from injury from work.
 - 1. Take protective measures to provide free and safe passage to occupied portions of building.
 - 2. Provide protection to ensure safe passage of the Owner's personnel and the public around demolition areas and to and from occupied portions of adjacent areas, buildings, and structures.
 - 3. Provide shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain.
 - 4. Protect existing work which becomes exposed during demolition operations.
 - a. Protect existing improvements, appurtenances, and conditions to remain.
 - b. Protect adjacent floors with coverings.
 - c. Protect walls, openings, roofs, and adjacent exterior construction to remain and exposed to building demolition operations.
 - 5. Construct temporary insulated dustproof partitions to separate areas from noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks. Refer to Drawings for location of partitions to be provided.

6. Provide temporary weather protection when exposing exterior conditions to prevent water leakage or damage to structure or interior areas of existing building.

- L. Damages: Promptly repair damages caused to adjacent facilities by demolition work.

1.8 COORDINATION

- A. Arrange selective demolition schedule to avoid interference with Owner's and the school's operations.

1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor prior to proceeding. Existing warranties to be provided by Owner prior to the start of construction.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying existing system has been inspected and warranty remains in effect. Submit supporting documentation at closeout.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Repair Materials: Use repair materials identical to existing materials.
 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 2. Use materials whose installed performance equals or surpasses that of existing materials.
- B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that affected utilities have been disconnected and capped before commencing selective demolition operations.
- B. Review Project Record Documents of existing construction or existing condition and hazardous material information provided by Owner. Owner does not warrant existing conditions are same as those indicated in Project Record Documents.
- C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- D. Survey of Existing Conditions: Record existing conditions with measured drawings or preconstruction photographs or video and templates.
 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3. For any electrical or low-voltage work to be performed in the project (including fire alarm, PA, intercom, or data), test entire system for operation prior to initiation of work. Notify Owner of any non-working components. Test entire system at the end of construction to ensure all systems operate properly.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.
- B. Pest Control: Employ certified, licensed exterminator to treat building and to control rodents and vermin before and during selective demolition operations.
- C. Site Access and Temporary Controls: Conduct selective demolition and debris removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities. Comply with requirements for access and protection.
- D. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling.
- E. Furnishings and Equipment: Cover and protect furniture, equipment, and fixtures from spoilage or damage as necessary.
- F. Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
 1. Construct dustproof partitions of not less than nominal 4 inch (100mm) studs, 5/8 inch (16mm) gypsum wallboard with joints taped on occupied side, and 1/2 inch (13mm) fire retardant plywood on the demolition side.
 2. Insulate partition to provide noise protection to occupied areas.
 3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
 4. Protect air handling equipment.
 5. Weatherstrip openings to prevent the spread of dust.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 2. Arrange to shut off utilities with utility companies.
 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

4. Disconnect, demolish, and remove fire suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations including, but not limited to SCAQMD Rule 403 (Fugitive Dust).
 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
 2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.

3.5 PROTECTION

- A. Temporary Protection: Provide temporary barricades and protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - a. Erect temporary pathways and means of egress necessary for ongoing operations compliant with Code and accessibility regulations.
 - b. Provide temporary barricades and protection required to prevent injury and damage to adjacent buildings and facilities to remain.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - a. Protect existing work which becomes exposed during demolition operations.
 - b. Protect adjacent entrances from damage due to demolition activities.
 - c. Protect existing improvements, appurtenances, and conditions to remain.
 - d. Protect floors with covering.
 - e. Protect walls, openings, roofs, and adjacent exterior construction to remain and exposed to building demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling.
 - a. Construct temporary insulated dustproof partitions to separate areas from noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks.

- b. Construct dustproof partitions of not less than nominal 4 inch (100mm) studs, 5/8 inch (16mm) gypsum wallboard with joints taped on occupied side, and 1/2 inch (13mm) fire retardant plywood on the demolition side.
 - c. Insulate partition to provide noise protection to occupied areas.
 - d. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
 - e. Protect air handling equipment.
 - f. Weatherstrip openings.
6. Damage: Promptly repair damages to adjacent components cause by demolition activities.
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.6 SELECTIVE DEMOLITION

- A. Demolish and remove existing construction to the extent necessary for new work. Use methods required to complete the work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame cutting operations. Maintain portable fire suppression devices during flame cutting operations.
 5. Maintain fire watch during and for at least 24 hours after flame cutting operations.
 6. Maintain adequate ventilation when using cutting torches.
 7. Remove decayed, vermin infested, and dangerous or unsuitable materials and promptly dispose of offsite.
 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 9. Locate selective demolition equipment and remove debris and materials to avoid imposing excessive loads on supporting walls, floors, or framing.
 10. Dispose of demolished items and materials promptly.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris removal operations to ensure minimum interference with roads, streets, walks, walkways, and adjacent occupied and used facilities.
- C. Removed and Salvaged Items: Remove items indicated for salvage. Clean and pack or crate items after cleaning. Identify contents of containers. Store items in secure area until delivery to Owner.
1. Transport items to Owner's storage area designated by Owner. Protect items from damage during transport and storage.

- D. Removed and Reinstalled Items: Clean and repair items to functional condition adequate for intended reuse.
 - 1. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 2. Protect items from damage during transport and storage.
 - 3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Owner, items may be removed to a suitable, protected storage location during selective demolition, cleaned, and reinstalled in original locations after selective demolition operations are complete.
- F. Patching and Repair: Repair damage to adjacent construction caused by selective demolition operations promptly.

3.7 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- C. Concrete Slabs on Grade: Saw cut perimeter of area to be demolished, and then break up and remove.
- D. Interior Slab on Grade: Use best practice removal methods to prevent cracking or structurally disturbing adjacent slabs or partitions. Use power saw where possible.
- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in *RFCI Recommended Work Practices for the Removal of Resilient Floor Coverings*. Do not use methods requiring solvent-based adhesive strippers.
- F. Below Grade Voids: Completely fill below grade areas and voids resulting from demolition work. Provide fill consisting of approved earth, gravel, or sand, free of trash and debris, stones over 6 (150mm) inches in diameter, roots, or other organic matter.
- G. Partitions: Completely remove indicated interior partitions and interior finishes indicated. Leave adjacent work scheduled to remain sound and ready for patching or for new finishes.
- H. Doors and Frames: Remove doors, frames, and hardware where indicated. Remove from site.
 - 1. Remove doors, frames, and hardware where indicated. Clean, store, and protect for reinstallation or return hardware to Owner as directed.
- I. Windows: Remove existing windows where indicated. Remove associated anchors, shims, blocking, operating devices, sealant, and trim. Cut back interior finishes required for plumb surface for patching. Leave openings ready for installation of new materials and finishes.

- J. Mechanical, Electrical, and Structural Elements: If unanticipated mechanical, electrical, or structural elements conflicting with intended function or design are encountered, investigate and measure both nature and extent of the conflict.
 - 1. Submit written report to Architect in accurate detail. Pending receipt of directive, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.
 - 2. HVAC Equipment: Remove air conditioning equipment without releasing refrigerants.

3.8 REMOVAL OF STRUCTURAL ELEMENTS

- A. Foundation: Demolish foundation walls to a minimum depth of 12 inches (300mm) below existing ground surface. Demolish and remove below grade wood or metal construction. Break up below grade concrete slabs.
- B. Pneumatic Operated Hammers: When possible, reduce use of pneumatic operated hammers. When necessary to use pneumatic tools, locate compressors as remote from occupied areas as possible.
 - 1. To break large pieces of concrete, isolate concrete from floor slabs and building structure to prevent structure borne vibration.
- C. Saw Cutting: Locate compressors as remote as possible from occupied areas of facility.
 - 1. Use diamond tipped saw blades and related equipment.
 - 2. Saw cut portions of walls and slabs. Angle saw blade at floors and corners to cut as closely as possible to desired location.
 - 3. Control runoff water used with saw to prevent damage to existing materials.

3.9 ROOF REMOVAL

- A. Roof Assembly: Remove existing roofing to the extent that can be covered in one day by new roofing. Maintain building interior in watertight and weathertight condition.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing system down to substrate.
- B. At new column extensions, cut through roofing as required for welding of new extension. Provide temporary watertight enclosure over stubs and temporarily flash to existing roof to make completely watertight.
- C. At existing parapets, remove portions of roofing, flashing, stone, and masonry necessary to weld new steel and set form work. Provide temporary watertight enclosures over areas of open roof and temporarily flash to make watertight.
- D. As column forms are placed, temporarily flash columns to existing roofing and cover with watertight tarpaulins before and after pouring. After column forms have been removed, temporarily flash new concrete structure into existing roofing immediately to maintain watertight roof.
- E. When removing roofing to place supports for shoring of form work to transfer loads to existing columns or approved structure or to support scaffolding, work platforms, or similar loads, temporarily flash supports to make roof watertight.
- F. Remove excess residue. Thoroughly clean and remove asphalt, dust, loose materials and leave ready for new work.

3.10 PATCHING AND REPAIRS

- A. Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. Patching: Comply with Section 01 73 29.
- C. Repairs: When necessary to repair to existing surfaces, patch to produce surfaces suitable for new materials.
 - 1. Fill holes and depressions in existing masonry walls to remain with masonry patching material applied according to manufacturer's written recommendations.
- D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.
- E. Floors and Walls: Where walls or partitions are demolished, 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.
 - 1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 - 2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
 - 3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- F. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.11 DISPOSAL OF DEMOLISHED MATERIALS

- A. Legally remove demolition waste materials from site and dispose in an EPA approved construction and demolition waste landfill acceptable to authorities having jurisdiction recycle or reuse components.
 - 1. Do not allow demolished materials to accumulate on site.
 - 2. Remove and transport debris to prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or devices that conveys debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Section 01 74 19.
- B. Burning: Do not burn demolished materials.

3.12 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 03 02 00 - CONCRETE RESURFACING, REPAIR, AND MOISTURE VAPOR MITIGATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes: Preparation of existing interior concrete slabs, including shot blasting, surface defect repair, application of moisture vapor control system, and moisture vapor and pH testing, where indicated on drawings, for underlayment and finish flooring specified in other sections.

1.3 REFERENCE STANDARDS

- A. Standards: Use current versions
 1. ASTM F3010 Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Covering.
 2. ASTM C1583 Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method).
 3. ASTM D7234 Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
 4. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 5. ICRI Guide 310.2R Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.
 6. RFCI Recommended Work Practices for the Removal of Resilient Floor Coverings, Resilient Floor Covering Institute.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the requirements and Conditions of the Contract in Division 1 Specification Sections.
- B. Product data: Submit manufacturer's data sheets and supporting information for each product and process specified including:
 1. Product specifications
 2. Installation instructions
 3. Manufacturer's certification that moisture vapor control products meet requirements of current version of ASTM F3010.
 4. Independent test reports supporting product manufacturer's certificate of conformance to ASTM F3010.
 5. Completed manufacturer's pre-installation checklist.
 6. Warranty Information.
- C. Moisture Tests: Submit concrete floor moisture test results required by floor covering manufacturer. Perform moisture testing as described in ASTM Practice F710. Testing shall be performed according to the floor covering manufacturer's specified ASTM Standard Test Method by an independent Testing Agency. Testing shall be performed by ICRI Tier 2 Certified Moisture Testing Technician. Provide moisture test results to the Architect, Owner, General Contractor, and Moisture Vapor Control System Manufacturer's Representative.

1.5 QUALITY ASSURANCE

A. Qualifications of Applicator

1. Employ an Applicator trained and currently approved by the moisture vapor control system manufacturer, experienced in surface preparation and application of the products of this section, and subject to observation by the manufacturer.
2. Submit list of at least three similar projects performed by the applicator within the previous five years that used the same products and similar moisture vapor control system design.

B. Manufacturer's Qualifications

1. Manufacturer shall have not less than ten (10) years' experience in manufacturing moisture vapor control systems. The moisture vapor control system must be specifically formulated and marketed for concrete floor slab moisture vapor control and pH control.

C. Provide manufacturer's standard fifteen (15) year warranty at no additional cost. Applicator of moisture vapor control system shall provide standard installation warranty for workmanship.

D. Mockup: Install the moisture control system in a minimum 100 sq ft mockup area, using the same methods 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 D7234. The results must be equal to or greater than 200 psi with failure in the concrete before proceeding with installation of the moisture control system

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products to the job site in original unopened containers, clearly labeled with the manufacturer's name and brand designation. Each container shall be marked with batch or lot code traceable to manufacturing information.

B. Store products in an approved ventilated dry area; protect from dampness, freezing, and direct sunlight. Product shall not be stored in areas with temperatures in excess of 90°F or below 50°F unless permitted by manufacturer's instructions.

C. Handle products using methods that prevent breakage or damage of containers and prevent contamination of products.

1.7 PROJECT/SITE CONDITIONS

A. Environmental Conditions:

1. Do not apply moisture vapor control system to surfaces that may be exposed to uncontrolled weather conditions such as precipitation, wind, direct sunlight, etc. Do not apply when moisture is accumulated on the surface of the concrete or if precipitation is anticipated before the moisture control coating has cured.
2. Do not apply moisture vapor control system when temperature is lower than 50°F or higher than 90°F or expected to fall outside this temperature range within 24 hours after application. Do not apply moisture vapor control coating when temperature is above 80°F and rising or expected to rise during curing period of the moisture control coating.

B. Protection:

1. Protect moisture vapor control system after installation to prevent damage from topical moisture, direct sunlight, and construction traffic for a minimum period of 24 hours after application.

1.8 SCHEDULING

- A. The Independent Testing Agency will coordinate scheduling with the Owner for moisture testing to permit sufficient time to test, submit and evaluate test results, and install the moisture vapor control system before installation of floor coverings.
- B. The moisture vapor control system manufacturer's instructions must allow installation as early as 7 days after concrete placement.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: KOSTER VAP I[®] 2000 System, as manufactured by KOSTER American Corporation, 2585 Aviator Drive, Virginia Beach, VA 23453; (757) 425-1206; www.kosterusa.com
 1. Other approved manufacturers: Ardex MC & MAPEI.
- B. Moisture vapor control system shall be the product of a single manufacturer. Equivalent products of other manufacturers may be submitted for review and approval as substitutions in accordance with Section 01 25 13 Product Substitution Procedures.

2.2 MATERIALS

- A. General: Use materials of one manufacturer throughout the project as hereinafter specified.
- B. Moisture Vapor Control Coating: Select from among the following products. (If fast setting time is not essential, use the first option below.)
 1. KOSTER VAP I[®] 2000 ZERO VOC; 12 hour setting time, Zero VOC, 2-part epoxy resin coating
 2. KOSTER VAP I[®] 2000 FS; 4 to 5 hour setting time, Zero VOC. 2-part epoxy resin coating
 3. KOSTER VAP I[®] 2000 UFS; 3 to 4 hour setting time, low VOC, 2-part epoxy resin coating
- C. Primer for underlayment:
 1. KOSTER VAP I[®] 06 Primer – non-porous substrate primer for use on VAP I[®] 2000 resin coating
- D. Self-Leveling underlayment: Select from among the following products
 1. KOSTER SL
 2. KOSTER SL Premium
 3. KOSTER SC
- E. Primer for porous concrete containing excessive near-surface voids or high concrete surface profile
 1. KOSTER KB-Pox IN, low viscosity, high modulus, 2-part epoxy resin
- F. Repair resin for non-movement joints and cracks
 1. KOSTER KB-Pox IN low-viscosity, high modulus 2-part epoxy gravity-feed, crack injection resin

- G. Thickening agent for repairing spalls and excessively rough concrete
 - 1. KOSTER TA thickening agent, non-silica
- H. Movement joint sealant
 - 1. KOSTER FS-H polysulfide resin joint sealant
 - 2. Backer rod and accessory materials

PART 3 – EXECUTION

3.1 EXAMINATION OF SUBSTRATE BEFORE INSTALLATION

- A. Provide information required in moisture control system manufacturer's pre-job checklist. Submit completed checklist to moisture control system manufacturer for review before installation of the moisture control system.
- B. Concrete floor slab moisture testing is not required prior to application of moisture control system.
 - 1. If moisture testing is performed, moisture testing shall be conducted according to the latest version of ASTM F2170 using relative humidity probes that have been allowed to equilibrate at each test location for at least two hours. Provide report in accordance with ASTM F2170 and floor plan showing moisture test results.
- C. Testing and evaluation for deleterious materials and contaminants that inhibit moisture control coating adhesion
 - 1. It is the responsibility of the owner to provide a concrete floor slab free of contaminants and deleterious materials that can inhibit bond to the moisture control coating or develop deleterious reactions after the concrete floor slab is sealed.
 - 2. Concrete substrates must be structurally sound, solid, and meet industry standards as defined in ACI Committee 201 Report "Guide to Durable Concrete." Surfaces must be free of moisture-sensitive patching and leveling materials, adhesives, coatings, curing compounds, concrete sealers, efflorescence, dust, grease, oils and any other materials or contaminants that can act as bond breakers.
 - 3. The floor slab surface must be capable of withstanding steel shotblast preparation to ICRI CSP3. Excessively weak, soft, dusty, cracked, or uneven surfaces may not be suitable substrates, and may require additional concrete surface removal or patching before application of the moisture control coating. Such compounds must be long term resistant to high moisture and high pH.
 - 4. Contaminated concrete may not be suitable to receive a moisture control coating. Testing and evaluation for contaminants and concrete condition is not required but is strongly recommended. Testing and evaluation of the floor slab can include:
 - a. Solvent extraction and analysis for organic compounds such as oil, grease, plasticizers, silicones, solvents, and other chemical compounds that can inhibit bond to the epoxy moisture control coating.
 - b. Microscopical (petrographic) examination according to ASTM C856 to evaluate the concrete condition.
 - 5. Do not install moisture control system if substrate testing reveals unacceptable conditions.

3.2 PREPARATION

- A. Remove existing floor finishes including floor coverings, coatings, paint, and adhesives. Follow *RFCI Recommended Work Practices for the Removal of Resilient Floor Coverings*.

- B. Abrasive surface preparation.
 - 1. Grind perimeter of rooms and areas inaccessible to shotblasting using dry diamond media with vacuum dust extraction. Grind to ICRI CSP2. Do not smooth polish these areas. Grinding is allowed only in areas not accessible to shot blasting
 - 2. Shot blast floors to ICRI CSP3. Shot blast as close as possible to walls, doorways, casework, and other permanently installed objects. Remove residual steel shot.
 - 3. Acid etching is not permitted.
- C. Remove residual dust and debris by vacuum and dry sweeping. Do not use sweeping compound. Remove all foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, shot blast beads, etc.
- D. Test concrete surface tensile strength after abrasive preparation in accordance with requirements of ASTM F3010 following Test Method C1583. If test results are less than 200 psi, repair concrete or repeat surface preparation to achieve required concrete surface tensile strength.
- E. Repair non-movement cracks, control joints, and large surface defects such as spalls, holes, and voids in accordance with manufacturer's recommendations. Use low-viscosity, gravity-fed crack mending resin for non-movement cracks and joints. Crack repair compound can be mixed with not more than 3 parts clean, washed, dry silica sand for sawcut control joints and wide cracks. Brush interior walls of crack or joint with neat crack repair epoxy resin before applying sand-resin mixture. After curing, grind surface flush with surrounding concrete.
- F. Repair spalls or excessively rough concrete surface using manufacturer's fiber thickening agent mixed 1:1 by volume with moisture control resin. Mix thickening agent and resin thoroughly to uniform creamy consistency and apply by trowel, working material tightly against clean, roughened concrete surface.
- G. Do not fill designed movement joints with moisture control epoxy resin. Fill movement joints with manufacturer's recommended flexible joint filling compound or mechanical movement joint cover.
- H. Reinforcing fibers that become visible after shot blasting must be removed and vacuumed leaving no fibers exposed above the concrete surfaces. Provide an uncontaminated, clean, sound surface.

3.3 MIXING

- A. Mix two-part moisture control resin and hardener thoroughly for three minutes in manufacturers supplied containers following manufacturer's requirements to obtain a homogeneous mixture. Use a low speed motor less than 400 rpm and a two bladed Jiffy-type mixing blade only. Do not aerate.
- B. If smaller quantities are required, maintain manufacturer's specified mix ratios by volume.
- C. Do not dilute with solvent.

3.4 APPLICATION

- A. After mixing, immediately pour material on the substrate in a ribbon. Empty can completely. Do not invert can to drain on concrete.

- B. Spread moisture control coating using manufacturer's recommended notched squeegee and back-roll with a 3/8-in. nap epoxy-rated, non-linting roller. Completely cover the entire concrete surface with a uniform application of the moisture control coating as quickly as possible and allow the coating to self-level. Work into a wet edge and assure continuity of the coating across the entire area.
- C. Spread coating on ICRI CSP3 shotblasted concrete surface at 100 to 150 sq ft/gal. Concrete prepared to CSP3 coated at 100 to 150 sq ft/gal will yield average cured coating thickness 11 to 16 mils (0.011 to 0.016 in.). A rougher surface profile or a porous or absorptive concrete will require the use of more material to achieve sufficient coating thickness. KOSTER VAP I® 2000 moisture control coatings must be installed at a minimum layer thickness of at least 11 mils (0.011 in.). Less layer thickness results in a higher permeance of the cured coating that will not meet performance requirements of ASTM F3010.
- D. Allow coating to cure the minimum length of time specified for the product.

3.5 INSPECTION

- A. Inspect cured moisture control coating for complete, uniform coverage. Repair or install additional coats as necessary to produce a uniform, flat, smooth, coating surface that meets manufacturer's minimum thickness requirements in all areas.
- B. Test adhesion of the moisture control coating to the concrete substrate as required in ASTM F3010 following Test Method D7234. Tensile bond strength of the coating must be at least 200 psi with failure in the concrete. Repair or replace areas that do not meet this requirement.

3.6 CEMENTITIOUS UNDERLAYMENT

- A. After installation of the moisture control coating, self-leveling cementitious underlayment or trowelable cementitious skim coat can be installed.
 - 1. Apply KOSTER VAPI®06 Primer at 650 to 800 sq ft/gal using a non-linting short-nap roller. Apply a thin, uniform coating over the entire cured moisture control epoxy coating. Do not dilute with water or solvent. Do not apply thicker than 650 sq ft/gal.
 - 2. Mix and apply KOSTER SL standard underlayment, KOSTER SL Premium underlayment, or KOSTER SC skim coat following manufacturer's instructions. Allow to cure and dry according to manufacturer's instructions before installing floor coverings.

3.7 CLEANING

- A. Clean tools and equipment in contact with epoxy resins using xylene or other suitable cleaning agent immediately after use.
- B. Remove debris and unused materials from project site. Dispose chemicals, rags, and other materials in accordance with applicable regulations and specific jobsite instructions.

3.8 PROTECTION

- A. Protect applications of the moisture control system during the specified cure period from traffic, topical moisture, and contaminants.
- B. Protect installed cementitious underlayment or skim coat until floor covering installation.

END OF SECTION 03 02 00

SECTION 03 20 00 CONCRETE REINFORCING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section is related to concrete reinforcement and includes:
 - 1. Reinforcing steel for cast-in-place concrete foundations.
 - 2. Reinforcing steel for cast-in-place concrete slabs-on-grade.
 - 3. Supports and accessories for steel reinforcement.
- B. Related Sections:
 - 1. Section 03 10 00: Concrete Forming and Accessories.
 - 2. Section 03 30 00: Cast-in-Place Concrete.
 - 3. Section 05 12 00: Structural Steel Framing.
- C. Reference Standards:
 - 1. ACI 301 Specifications for Structural Concrete.
 - 2. ACI 318 Building Code Requirements for Structural Concrete and Commentary.
 - 3. ACI SP-066 ACI Detailing Manual.
 - 4. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - 5. ASTM A706/A706M Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
 - 6. ASTM A775/A775M Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
 - 7. ASTM D3963/D3963M Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
 - 8. AWS D1.4 Structural Welding Code - Reinforcing Steel.
 - 9. CRSI Concrete Reinforcing Steel Institute Manual of Standard Practice.
 - 10. CRSI Concrete Reinforcing Steel Institute Placing Reinforcing Bars.

1.3 SUBMITTALS

- A. See Section 01 33 00: Submittal Procedures.
- B. Shop Drawings:
 - 1. Comply with requirements of ACI SP-066. Include the following:
 - a. Complete bar layout.
 - b. Representative sections.
 - c. Details for congested conditions.
 - d. Proposed layout where vertical and horizontal bars intersect.
 - e. Bar schedules.
 - f. Typical bending diagrams and offsets.
 - g. Shapes of bent bars.
 - h. Spacing of bars.
 - i. Splice lengths and locations.

- C. Where welding is proposed:
 - 1. Detail welding to conform to AWS D1.4.
 - 2. Submit copies of welding operator's certificate.
 - 3. Where reinforcement complying with ASTM A615 is to be welded, chemical tests shall be performed to determine the weldability in accordance with ACI 318.
 - 4. Weld procedure specifications (WPS):
 - a. All WPS's shall be submitted to the Structural Engineer of Record (SEOR) for review and approval prior to use.
 - b. For WPS's that have been qualified by test, the supporting Procedure Qualification Record (PQR) shall be submitted to the SEOR for review and approval.
 - c. Included shall be WPS for repair welds.
- D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.4 QUALITY ASSURANCE

- A. Comply with the pertinent provisions of Section 01 40 00: Quality Requirements.
- B. Perform work of this Section in accordance with ACI 301.
- C. Welders' Certificates: Submit certifications for welders employed on the Project, verifying AWS qualification within the previous 12 months.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with pertinent provisions of Section 01 60 00: Product Requirements, delivering materials in a timely manner to ensure uninterrupted progress.
- B. Bundle bars, tag with identification, and transport and store so as not to damage any material. Use metal tags indicating size, length, and other marking shown on placement drawings. Maintain tags after bundles are broken.
- C. Avoid exposure to dirt, moisture, or conditions harmful to reinforcement.

~~D. — Extra Material:~~

- ~~1. — Provide an allowance of an additional ten percent (10%) of the total reinforced steel tonnage in addition to the quantities shown on the Drawings. This additional steel shall be installed in sizes and locations as directed by the structural Engineer.~~

PART 2 PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Steel:
 - 1. ASTM A615/A615M, Grade 60 (60,000 psi):
 - a. Deformed billet-steel bars.
 - b. Unfinished.
 - c. Only to be used for conditions where bars will not be welded.
- B. Reinforcing Steel:
 - 1. ASTM A706/A706M, Grade 60 (60,000 psi) deformed low-alloy steel bars:
 - a. Unfinished.
 - b. Used in all cases where welding of bars is required.

- C. Reinforcement Accessories:
 - 1. Tie wire: ASTM A1064, annealed copper bearing steel, minimum 16 gage, 0.0508 inch.
 - 2. Chairs, bolsters, bar supports, spacers:
 - a. Sized and shaped for adequate support of reinforcement during concrete placement. Standard manufactured products shall conform to the Concrete Reinforcing Institute Manual of Standard Practice, latest edition.
 - 3. Use dense precast concrete supports with embedded wire ties for reinforcement placed on grade. Elsewhere, use wire bar supports.
- D. Welding electrodes: AWS D1.4, Table 5.1 and 5.3, low hydrogen electrodes, E8018 for Grade 60 steel.

2.2 REBAR SPLICING

- A. Coupler Systems: Mechanical devices for splicing reinforcing bars conforming to the requirements of ACI 318; capable of developing 1.25fy of the steel reinforcing yield strength in tension and compression.
- B. For reinforcement, all mechanical splices in Special Structural Walls, Special Moment Frames, and Concrete Diaphragms shall be Type 2, conforming to the requirements of ACI 318, capable of developing 1.25fy of the steel reinforcing yield strength in tension and compression, and develop the specified tensile strength of the spliced bar:
 - 1. Products:
 - a. Dayton Superior Corporation; Bar Lock Coupler System: www.daytonsuperior.com (ICC-ESR 2481).
 - b. Lenton Lock Couplers (IAPMO-ES 129).
- C. Dowel Bar Splicer with Dowel-Ins:
 - 1. Mechanical devices for connecting dowels; capable of developing full steel reinforcing design strength in tension and compression.
 - a. Products:
 - 1) Dayton Superior Corporation; Dowel Bar Splicer D101A with Straight Dowel-In: www.daytonsuperior.com.
 - 2) Lenton Form Savers (IAPMO-ES 129).

2.3 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI - Manual of Standard Practice.
- B. Bending and Forming:
 - 1. Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials.
 - 2. Do not heat reinforcement for bending.
 - 3. Bend bars No. 6 size and larger in the shop only.
 - 4. Bars with unscheduled kinks or bends are subject to rejection.
 - 5. Use only tested and approved bar materials.
- C. Welding:
 - 1. Use only ASTM A706 steel where welding is proposed:
 - a. Perform welding where shown or approved, by the direct electric arc process in accordance with AWS D1.4 using specified low hydrogen electrodes.
 - b. Preheat six inches (6") each side of joint.
 - c. Protect joints from drafts during the cooling process; accelerated cooling is prohibited.
 - d. Do not tack weld bars.

- e. Welding shall not be done on or within two (2) bar diameters of any bent portion of a bar that has been bent cold.
 - f. Welding of crossing bars shall not be permitted for assembly reinforcement unless authorized by the SEOR.
 - g. Clean metal surfaces to be welded of all loose scale and foreign material.
 - h. Clean welds each time electrode is changed and chip burned edges before placing welds.
 - i. When wire brushed, the completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration to the base metal.
 - j. Cut out welds or parts of welds found defective with chisel and replace with proper welding.
 - k. Fillet welds may be considered prequalified per AWS D1.4.
 - l. Other welds are to be qualified per AWS D1.4.
- D. Where ASTM A615 steel is to be used or occurs in existing elements and is to be welded:
- 1. Complete chemical analyses shall be performed to determine chemical composition and, for a new bar, provided in the mill certifications to determine weldability in accordance with ACI 318 with modifications per AWS D1.4.
 - 2. The carbon equivalency (CE) shall be clearly defined and bars with a CE above 0.75 shall not be welded.
 - 3. Welding Procedure Specifications and supporting PQRs with required testing per AWS D1.4 shall be provided for review and approval prior to welding.
 - 4. These WPS and PQRs shall be specific to the CE as determined above, and shall, in addition to the other AWS requirement, include minimum and maximum preheat and interpass temperatures that are specified to the CE. This preheat and interpass temperature shall be strictly enforced in the field.
 - 5. If separate shipments of bars vary the weldability, the process listed in the above requirements shall be repeated for these new bars.
- E. Locate reinforcing splices not indicated on Drawings at point of minimum stress. Review locations of splices with SEOR.

PART 3 EXECUTION

3.1 PLACEMENT

- A. Before placing bars, and again before concrete is placed, clean bars of loose rust and/or mill scale, dirt, oil, or any other coating that may be deleterious or could reduce bond with the concrete.
- B. Securing in place:
 - 1. Accurately place bars and wire tie in precise position where bars cross.
 - 2. Bend ends of wire ties away from the forms.
 - 3. Wire tie bars to the corners of ties and stirrups.
 - 4. Support bars according to the Concrete Reinforcing Steel Institute (CRSI) "Placing Reinforcing Bars," using approved accessories and chairs.
 - 5. Place precast concrete cubes with embedded wire ties to supporting reinforcing steel bars in concrete placed on grade and in footings.
 - 6. Take adequate precautions to ensure that reinforcing bar position and spacing is maintained during concrete placement.
- C. Do not displace or damage vapor barrier.

- D. Maintain concrete cover around reinforcing per requirements on Drawings.
- E. Splices:
 - 1. Do not splice reinforcing bars at the points of maximum stress except where indicated.
 - 2. Lap splices as shown or required to develop the full strength or stress of the bars.
 - 3. Stagger splices in horizontal wall bars at least 48 inches longitudinally in alternate bars and opposite faces.
- F. Field Welding: As specified for fabrication.

3.2 FIELD QUALITY CONTROL

- A. Comply with all pertinent provisions of Section 01 40 00: Quality Requirements.
- B. Supervision: Perform Work to this Section under supervision of a capable superintendent.
- C. An independent testing agency, as specified in Section 01 40 00: Quality Requirements, shall inspect installed reinforcement for conformance to Contract Documents before concrete placement.
- D. Where welding is done in the shop or at the site, perform welding of reinforcing bars under inspection of the testing laboratory welding inspector in accordance with Chapter 17 of the CBC. The welding inspector shall make a systematic record of all welds:
 - 1. Identification marks of welders.
 - 2. List of defective welds.
 - 3. Manner of correction of defects:
 - a. The welding inspector shall check the material, equipment details of construction and procedures, as well as the welds. The inspector shall check the ability of the welder. The welding inspector shall furnish the structural Engineer and the enforcement agency with a verified report that the welding required to be inspected is proper and has been done in conformity with the approved Plans and Specifications. The welding inspector shall use all means necessary to determine the quality of the weld. The inspector may use gamma ray, magnaflux, trepanning, sonics, or any other aid to visual inspection, which the inspector may deem necessary to assure the adequacy of the welding.

END OF SECTION 03 20 00

SECTION 03 30 00 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings and foundation walls.
 - 2. Interior slabs-on-grade.
 - 3. Exterior slabs-on-grade.
- B. Special Coordination Requirements: Coordinate with the work of the following Sections to identify the finish flooring manufacturer's concrete slab requirements. Such requirements may be over and above the requirements of the Contract Documents and may require additional materials, means, or methods, which shall be included as part of the Work.
- C. Related Sections:
 - 1. Section 01 32 00: Construction Progress Documentation.
 - 2. Section 03 10 00: Concrete Forming and Accessories.
 - 3. Section 03 20 00: Concrete Reinforcing.
 - 4. Section 03 35 00: Concrete Finishing.
 - 5. Section 03 35 43: Polished Concrete Finishing.
 - 6. Division 22: Plumbing.
 - 7. Division 23: Mechanical.
 - 8. Division 26: Electrical.

1.3 DEFINITIONS

- A. Cementitious Materials:
 - 1. Portland cement alone or in combination with one or more of the following, subject to compliance with requirements:
 - a. Blended hydraulic cement.
 - b. Fly ash and other pozzolans.
 - c. Ground granulated blast-furnace slag.
 - d. Silica fume.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Certificates: Weighmaster's certificates.
- E. Material Certificates:
 - 1. For each of the following, signed by manufacturers:
 - a. Cementitious materials.
 - b. Admixtures.
 - c. Waterstops.
 - d. Curing materials.
 - e. Floor and slab treatments.
 - f. Bonding agents.
 - g. Adhesives.
 - h. Vapor retarders.
 - i. Semi-rigid joint filler.
 - j. Joint-filler strips.
 - k. Repair materials.
- F. Material Test Reports:
 - 1. For the following, from a qualified testing agency, indicating compliance with requirements:
 - a. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
 - b. Vapor retarder: Provide third part documentation that all testing was performed on a single production roll and a summary of test results per ASTM E1745.

1.5 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - a. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA).
 - b. American Concrete Institute (ACI) Publications:
 - 1) Comply with the following unless modified by requirements in the Contract Documents:
 - a) ACI 301, "Specifications for Structural Concrete."
 - b) ACI 117, "Specification for Tolerances for Concrete Construction and Materials and Commentary."
 - c) ACI 302.1R, "Guide to Concrete Floor and Slab Construction."
 - d) ACI 302.2R, "Guide for Concrete Slabs that receive Moisture-Sensitive Flooring Materials."
 - e) ACI 305R, "Guide to Hot Weather Concreting."
 - f) ACI 306R, "Guide to Cold Weather Concreting."
 - g) ACI 318, "Building Code Requirements for Structural Concrete and Commentary."
- B. Manufacturer Qualifications:
 - 1. A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment:
 - a. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

- C. Source Quality Control: Furnish Weighmaster's certificates for all concrete.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."
- E. Concrete Testing Service: Engage a qualified independent testing agency approved by DSA to perform material evaluation tests and to design concrete mixtures.
- F. Pre-Installation Meeting: Conduct meeting onsite. Include product and material manufacturers.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete:
 - 1. Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in large sizes to minimize number of joints:
 - a. Plywood, metal, or other approved panel materials.
 - b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - 1) High-density overlay, Class 1 or better.
 - 2) Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - 3) Structural 1, B-B or better; mill oiled and edge sealed.
 - 4) B-B (concrete form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4-inch by 3/4-inch minimum.
- D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- E. Form-Release Agent:
 - 1. Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces:
 - a. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties:
 - 1. Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal:
 - a. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60.
- B. Welded Reinforcing Bars: Low-alloy-steel reinforcing bars, ASTM A706/A706M, deformed.
- C. Do not use reinforcement having any of the following defects:
 - 1. Bar lengths, depths, or bends exceeding the specified fabricating tolerances.
 - 2. Bends or kinks not indicated on the Drawings or required for this Work.
 - 3. Bars with cross-section reduced due to excessive rust or other causes.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports:
 - 1. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material:
 - 1. Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - a. Portland Cement - ASTM C150, Type I/II. Supplement with the following:
 - 1) Fly Ash: ASTM C618, Class F.
- B. Normal-Weight Aggregates:
 - 1. ASTM C33:
 - a. Maximum coarse-aggregate size: Per plan.
 - b. Fine aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C94 and potable.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260.
- B. Chemical Admixtures:
 - 1. Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride:
 - a. Water-reducing admixture: ASTM C494/C494M, Type A.
 - b. Retarding admixture: ASTM C494/C494M, Type B.
 - c. Water-reducing and retarding admixture: ASTM C494/C494M, Type D.
 - d. High-range, water-reducing admixture: ASTM C494/C494M, Type F.
 - e. High-range, water-reducing and retarding admixture: ASTM C494/C494M, Type G.
 - f. Plasticizing and retarding admixture: ASTM C1017/C1017M, Type II.

- C. Integral Waterproofing Admixtures:
1. ASTM C494, Type S, complex catalyzed hydrous silicate, water and vapor proofing liquid admixture:
 - a. Product: Subject to compliance with requirements, provide Moxie International Inc.; Moxie Shield 1800 Concrete Admixture, P.O. Box 838 Loomis, CA 95650; Contact Manufacturer's representative: P:916-251-0825, F: 877-330-1930 Email: info@moxieshield.com.
 - b. Properties:
 - 1) Water/cement ratio: Maximum 0.52.
 - 2) Water vapor transmission: Less than 0.1 perms (5.7 g/Pa-s-m²).
 - 3) Water seepage or permeability: Not to exceed 7.00 x 10⁻⁹ cm/s @ 50psi (2.3 x 10⁻¹⁰ ft/s).
 2. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder:
1. ASTM E1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape:
 - a. Products are subject to compliance with requirements. Acceptable products:
 - 1) Stego Industries, LLC: Stego Wrap 15 mil Class A.
 - 2) Grace Construction Products: Florprufe 120.
 - 3) W. R. Meadows, Inc.: Perminator 15 mil.
 - 4) Substitutions with Architect's approval, and pursuant to conditions of Divisions 00 and 01.
- B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D448, Size 57, with 100 percent passing a 1-1/2-inch sieve and zero to five percent (0%-5%) passing a No. 8 sieve.

2.7 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately nine-ounces-per-square-yard when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.

2.8 RELATED MATERIALS

- A. Non-Shrink Grout:
1. Factory premixed grout; ASTM C1107.
 2. Compressive strength: 8,000 psi at 28 days.
- B. Exterior Concrete Walks: Provide a capillary break consisting of two inches (2") of clean dry sand, ASTM C33, evenly spread on top of the compacted subgrade.

2.9 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301:
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
 - 2. All concrete mix designs shall be prepared and stamped by a California registered civil Engineer.
- B. Cementitious Materials:
 - 1. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - a. Fly Ash: 15 percent max.
- C. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings and Foundation Walls, Concrete Stairs, and Concrete Walls:
 - 1. Proportion normal-weight concrete mixture as follows:
 - a. Minimum compressive strength: As indicated on drawings.
 - b. Maximum water-cementitious materials ratio: As indicated on drawings.
 - c. Minimum cementitious materials content: As indicated on drawings.
 - d. Slump limit: As indicated on drawings.
- B. Interior Slabs-on-Grade:
 - 1. Proportion normal-weight concrete mixture as follows:
 - a. Minimum compressive strength: As indicated on drawings.
 - b. Maximum water-cementitious materials ratio: As indicated on drawings.
 - c. Minimum cementitious materials content: As indicated on drawings.
 - d. Slump limit: As indicated on drawings.
- C. Exterior Slabs-on-Grade:
 - 1. Proportion normal-weight concrete mixture as follows:
 - a. Minimum compressive strength: As indicated on drawings.
 - b. Maximum water-cementitious materials ratio: As indicated on drawings.
 - c. Minimum cementitious materials content: As indicated on drawings.
 - d. Slump limit: As indicated on drawings.

2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete:
 - 1. Measure, batch, mix, and deliver concrete according to ASTM C94/C94M, and furnish batch ticket information:
 - a. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time from 90 minutes to 75 minutes; when air temperature is above 90 degrees F reduce mixing and delivery time to 60 minutes.

2.13 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment:
 - 1. Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces:
 - a. Basis-of-design product: Subject to compliance with requirements, provide Moxie International Inc.; **Moxie Shield 1500 Concrete Sealer or Moxie Shield MFSII Flooring Sealer**, P.O. Box 838 Loomis, CA 95650; Contact Manufacturer's representative: P:916-251-0825, F: 877-330-1930 Email: info@moxieshield.com.
 - b. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Construct forms tight enough to prevent loss of concrete mortar.
- D. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- E. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. In no case shall any bolt or anchor be stabbed in place while or after the concrete is poured:
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

- A. General:
 - 1. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained:
 - a. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
 - b. Do not strip vertical concrete in less than seven (7) days.
 - c. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring:
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

- A. Sheet Vapor Retarders:
 - 1. Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions:
 - a. Lap joints six inches (6") and seal with manufacturer's recommended tape.
 - b. Seal all penetrations (including pipes) per manufacturer's tape.
 - c. No penetration of the vapor barrier is allowed except for reinforcing and permanent utilities.
 - d. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area six inches (6") and taping all four sides with tape.
 - e. Do not saturate the sand cushion.
 - f. If sand is saturated prior to placement of concrete, remove the sand and replace.
 - g. Protect all installed moisture barrier construction from precipitation and water penetration by covering and providing positive drainage away from the moisture barrier.
 - h. Cover slab openings and block-outs around columns to prevent water penetration of moisture barrier.

3.6 STEEL REINFORCEMENT

- A. General:
 - 1. Comply with CRSI's "Manual of Standard Practice" for placing reinforcement:
 - a. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
 - b. Clean reinforcement and remove loose dust and mill scale, earth, oil, and other materials that reduce bond or destroy bond with concrete.
 - c. Position, support, and secure reinforcement against displacement by forms, construction, and the concrete placement operations. Provide metal chairs, dobies, or other aids manufactured for this purpose.
 - d. Place reinforcement to obtain the required concrete coverages for concrete protection.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade:
 - 1. Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one inch (1") as follows:
 - a. Grooved joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - b. Sawed joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. Saw cut slab as soon as surface has hardened to where it can support the equipment and operator, normally within two (2) hours after finishing. Use saw designed for cutting fresh concrete, such as "Soff-Cut" or equal.
- D. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate 1/2 of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Deposit concrete continuously in one (1) layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation:
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least six inches (6") into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete:
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement:
1. Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures:
 - a. When average high and low temperature is expected to fall below 40 degrees F for three (3) successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - b. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - c. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- F. Hot-Weather Placement:
1. Comply with ACI 301 and as follows:
 - a. Maintain concrete temperature below 90 degrees F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - b. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish:
1. As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities:
 - a. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish:
1. As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities:
 - a. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.

- C. Rubbed Finish:
1. Apply the following to smooth-formed finished as-cast concrete where indicated:
 - a. Smooth-rubbed finish: Not later than one (1) day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 - b. Grout-cleaned finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one-part portland cement to 1-1/2-parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 - c. Cork-floated finish: Wet concrete surfaces and apply a stiff grout. Mix one-part portland cement and one-part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Except as may be shown otherwise on Drawings, provide the following finishes at the indicated locations.
- B. Scratch Finish:
1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction:
 - a. Apply scratch finish to surfaces that are to receive concrete floor toppings or mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish:
1. Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture:
 - a. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish:
1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings:
 - a. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic, or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

- b. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, ten-foot-long (10') straightedge resting on two (2) high spots and placed anywhere on the surface does not exceed 1/8 inch.
 - c. Contractor shall anticipate that grinding will be required as a result of curling or other slab defects. Grinding required to bring the slab surface into acceptable tolerances for finished flooring installation shall be included as part of the Work.
- E. Trowel and Fine-Broom Finish:
- 1. Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom:
 - a. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
- 1. Moisture curing: Keep surfaces continuously moist for not less than seven (7) days.
 - 2. Moisture-retaining-cover curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven (7) days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.13 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
- 1. Steel reinforcement placement.
 - 2. Steel reinforcement welding.
 - 3. Headed bolts and studs.
 - 4. Verification of use of required design mixture.
 - 5. Concrete placement, including conveying and depositing.
 - 6. Curing procedures and maintenance of curing temperature.
 - 7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests:

1. Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:
 - a. Testing frequency: Obtain one (1) composite sample for each day's pour of each concrete mixture exceeding five (5) cubic yards, but less than 25 cubic yards, plus one (1) set for each additional 50 cubic yards or fraction thereof.
 - b. Testing frequency:
 - 1) Obtain at least one (1) composite sample for each 50 cubic yards or fraction thereof of each concrete mixture placed each day, but not less than once for each 2,000 square feet of surface area for slabs or walls:
 - a) When frequency of testing will provide fewer than five (5) compressive-strength tests for each concrete mixture, testing shall be conducted from at least five (5) randomly selected batches or from each batch if fewer than five (5) are used.
 - c. Slump: ASTM C143/C143M; one (1) test at point of placement for each composite sample, but not less than one (1) test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - d. Air content: ASTM C231, pressure method, for normal-weight concrete; one (1) test for each composite sample, but not less than one (1) test for each day's pour of each concrete mixture.
 - e. Concrete temperature: ASTM C1064/C1064M; one (1) test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and one test (1) for each composite sample.
 - f. Unit weight: ASTM C567, fresh unit weight of structural lightweight concrete; one (1) test for each composite sample, but not less than one (1) test for each day's pour of each concrete mixture.
 - g. Compression Test Specimens:
 - 1) ASTM C31/C31M:
 - a) Cast and laboratory cure two (2) sets of two (2) standard cylinder specimens for each composite sample.
 - b) Cast and field cure two (2) sets of two (2) standard cylinder specimens for each composite sample.
 - h. Compressive-strength tests:
 - 1) ASTM C39/C39M; test one (1) set of two (2) laboratory-cured specimens at seven (7) days and one (1) set of two (2) specimens at 28 days:
 - a) Test one (1) set of two (2) field-cured specimens at seven (7) days and one (1) set of two (2) specimens at 28 days.
 - b) A compressive-strength test shall be the average compressive strength from a set of two (2) specimens obtained from same composite sample and tested at age indicated.
 - i. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 - j. Strength of each concrete mixture will be satisfactory if every average of any three (3) consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength.
 - k. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both seven (7) and 28-day tests.

- l. Nondestructive testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- m. Additional tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
- n. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- o. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 03 30 00

SECTION 05 40 00 COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Load bearing wall framing.
 - 2. Exterior non-load bearing wall framing.
 - 3. Floor joist framing.
 - 4. Roof rafter framing.
 - 5. Ceiling joist framing.
 - 6. Soffit framing.
 - 7. Accessories necessary for a complete installation.
- B. Related Sections:
- C. Related Sections:
 - 1. Section 05 40 00: Cold-Formed Steel Framing.
 - 2. Section 05 52 00 – Cold Form Metal Framing
 - 3. Section 09 21 16: Gypsum Board Assemblies.
 - 4. Section 09 90 00: Painting and Coating.

1.3 SUBMITTALS

- A. Product Data: Technical data for cold formed steel framing product and accessories including factory applied primers.
- B. Shop Drawings:
 - 1. Submit layout, spacings, sizes, thickness, and types of cold formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners:
 - a. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - b. Shall bear the seal of a Registered Professional Engineer, licensed in the State of California.
- C. Supplementary Design Details: The general design is presumed adequate to permit compliance with the specified performance. Provide engineering calculations and shop drawings to supplement the general design. Calculations shall bear the seal of a Registered Professional Engineer, licensed in the State of California. Calculations and shop drawings must show design will withstand wind loading commiserate with class and rating of the Project.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Welding qualifications:
 - a. Qualify procedures and personnel according to the following:
 - 1) AWS D1.3/D1.3M Structural Welding Code - Sheet Steel.
 - 2) CCFSS Technical Bulletin: "AISI Specification Provision for Screw Connections."
 - 2. Comply with AISI North American Specification for the Design of Cold Formed Steel Structural Members and Standard for Cold Formed Steel Framing - General Provisions:
 - a. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
 - 3. Fire resistance ratings: ASTM E119; testing by a UL. Identify products with appropriate markings of applicable testing agency. Indicate design designations from UL *Fire Resistance Directory*.
 - 4. Installer qualifications: Company specializing in the installation of cold formed metal framing components with minimum five (5) years' documented experience.
 - 5. Install system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
 - 6. Install system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
 - 7. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and galvanized-coating thickness.
- B. Professional Engineer Qualifications:
 - 1. A professional engineer who is legally qualified to practice in the State of California and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold formed metal framing that are similar to those indicated in material, design, and extent:
 - a. Engineering responsibility: Preparation of shop drawings, design calculations, and structural data.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1. CEMCO.
 - 2. ClarkDietrich Building Systems.
 - 3. Consolidated Fabricators Corp.
 - 4. SCAFCO Corporation.
 - 5. Substitutions with Architect's approval, pursuant to conditions of Divisions 00 and 01.

2.2 LOAD BEARING WALL FRAMING

- A. Steel Studs:
 - 1. C-shaped steel studs, of web depths indicated, punched, with stiffened flanges:
 - a. Minimum base metal thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange width: 1-5/8 inches (41 mm).
 - c. Section properties: Refer to the Drawings.
- B. Steel Track:
 - 1. U-shaped steel track, of web depths indicated, unpunched, with straight flanges:
 - a. Minimum base metal thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange width: 1-1/4 inches (32 mm).
- C. Steel Box or Back-to-Back Headers:
 - 1. C-shape used to form header beams, of web depths indicated, unpunched, with stiffened flanges:
 - a. Minimum base metal thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange width: 1-5/8 inches (41 mm).
- D. Steel Single or Double L Headers:
 - 1. L-shapes used to form header beams, of web depths indicated:
 - a. Minimum base metal thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Top flange width: 1-5/8 inches (41 mm).
 - c. Section properties: Refer to the Drawings.

2.3 EXTERIOR NONLOAD BEARING WALL FRAMING

- A. Steel Studs:
 - 1. C-shaped steel studs, of web depths indicated, punched, with stiffened flanges:
 - a. Minimum base metal thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange width: 1-5/8 inches (41 mm).
 - c. Section properties: Refer to the Drawings.
- B. Steel Track:
 - 1. U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - a. Minimum base metal thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange width: 1-1/4 inches (32 mm).
- C. Vertical Deflection Clips:
 - 1. Head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web:
 - a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1) ClarkDietrich Building Systems.
 - 2) SCAFCO Corporation.
 - 3) Simpson Strong-Tie Co., Inc.
 - 4) Steeler, Inc.
 - 5) Substitutions with Architect's approval, pursuant to conditions of Divisions 00 and 01.

- D. Single Deflection Track:
1. Single, deep leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure:
 - a. Minimum base metal thickness: 0.0428 inch (1.09 mm), 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange width: One inch (25 mm) plus the design gap for one story structures and one inch (25 mm) plus twice the design gap for other applications.
- E. Double Deflection Tracks:
1. 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 loads and transfer them to the primary structure:
 - 1) Minimum base metal thickness: 0.0428 inch (1.09 mm), 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - 2) Flange width: One inch (25 mm) plus the design gap for one story structures and one inch (25 mm) plus twice the design gap for other applications.
 - b. Inner track - of web depth indicated:
 - a. Minimum base metal thickness: 0.0428 inch (1.09 mm), 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
 - b. Flange width: One inch (25 mm) plus the design gap for one story structures and one inch (25 mm) plus twice the design gap for other applications.
- F. Drift Clips: Bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.4 CEILING JOIST FRAMING

- A. Steel Ceiling Joists:
1. C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges:
 - a. Minimum base metal thickness: 0.0428 inch (1.09 mm).
 - b. Flange width: Two inches (51 mm), minimum.

2.5 SOFFIT FRAMING

- A. Exterior Soffit Frame:
1. C-shaped steel sections, of web depths indicated, with stiffened flanges:
 - a. Minimum base metal thickness: **[0.0428 inch (1.09 mm)] [0.0538 inch (1.37 mm)]**.
 - b. Flange width: 1-5/8 inches (41 mm) minimum.

2.6 FRAMING ACCESSORIES

- A. Fabricate steel framing accessories from steel sheet, ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of appropriate thickness and configuration, unless otherwise indicated:
1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.

4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.
 8. Stud kickers and knee braces.
 9. Joist hangers and end closures.
 10. Hole reinforcing plates.
 11. Backer plates.
- C. Anchors, Clips, and Fasteners:
1. Steel shapes and clips: ASTM A36/A36M, zinc coated by hot dip process according to ASTM A123/A123M.
 2. Expansion anchors: Fabricated from corrosion resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488 conducted by a qualified testing agency.
 3. Power actuated anchors: Fastener system of type suitable for application indicated, fabricated from corrosion resistant materials, with allowable load capacities calculated, greater than or equal to the design load, as determined by testing per ASTM E1190 conducted by a qualified testing agency.
 4. Mechanical fasteners:
 - a. ASTM C1513, corrosion resistant coated, self-drilling, self-tapping, steel drill screws:
 - 1) Head type: Low profile head beneath sheathing.
 5. Welding electrodes: Comply with AWS standards.
- D. Miscellaneous Materials:
1. Galvanizing repair paint: SSPC-Paint 20 or ASTM A780.
 2. Non-metallic, non-shrink grout: Premixed, non-metallic, non-corrosive, non-staining grout containing selected silica sands, portland cement, shrinkage compensating agents, and plasticizing and water reducing agents, complying with ASTM C1107/C1107M, with fluid consistency and 30-minute working time.
 3. Shims: Load bearing, high density multimonomer plastic, and non-leaching; or of cold formed steel of same grade and coating as framing members supported by shims.
 4. Sealer gaskets: Closed cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

- A. Fabricate cold formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI specifications and standards, manufacturer written instructions, and specified requirements:
1. Fabricate framing assemblies using jigs or templates.
 2. Cut framing members by sawing or shearing; do not torch cut.
 3. Fasten cold formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted:
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to shop drawings, with screw penetrating joined members by no fewer than three (3) exposed screw threads.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

- C. Fabrication Tolerances:
 - 1. Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in ten (10) feet (1:960) and as follows:
 - a. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - b. Squareness: Fabricate each cold formed steel framing assembly to a maximum out of square tolerance of 1/8 inch (3 mm).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

3.2 PREPARATION

- A. Before sprayed fire resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire resistive materials, remove only as much as necessary to complete installation of cold formed framing without reducing thickness of fire resistive materials below required thickness to obtain fire resistance rating indicated. Protect remaining fire resistive materials from damage.
- C. Install load bearing shims or grout between the underside of load bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch (6 mm) to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 ERECTION

- A. General:
 - 1. Track anchors: Install anchors maximum four feet (4') on center; design anchors and spacing to carry live, dead, and wind loads.
 - 2. Track splices: Provide channel inserts or weld track splices.
 - 3. Erection: Install members plumb, level, and in a true plane.
 - 4. Fastenings: Make assembly rigid and secure, with welds free of voids and burnouts.
- B. Install metal framing systems in accordance with stud manufacturer's printed instructions.
- C. Runner Tracks:
 - 1. Install continuous tracks sized to match studs.
 - 2. Align tracks accurately to layout at base and tops of studs.
 - 3. Secure tracks as recommended by stud manufacturer, except do not exceed 24 inches on center for nail or power-driven fasteners, nor 16 inches on center for other types of attachment.
 - 4. Provide fasteners at corners and ends of tracks.
 - 5. Tracks shall be anchored to structural steel prior to installing sprayed on insulation.

6. Provide deflection track (DT), at top of stud walls at floor or roof above, typically. Allow for 1/2-inch movement of primary structure. Do not attach studs directly to deflection track.
 7. Vertical deflection clips: Provide manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure.
- D. Secure studs to top track and bottom runner track by means of approved self-drilling screws or welding at both inside and outside flanges of 14 gauge or heavier material. Screws and welds shall be of sufficient size to insure strength of connection. All welding shall comply with American Welding Society "Specification for Welding Sheet Steel in Structures."
 - E. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
 - F. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure. Use Zee clips as specified above. Weld "Z" shaped clips to structural members as shown on drawings. Maximum two feet (2') on center vertical.
 - G. Install supplementary framing, blocking, and bracing in the metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with the stud manufacturer's recommendations and industry standards in each case, considering the weight or loading resulting from the item supported.
 - H. Frame wall openings with extra studs, equal to the number of studs interrupted by wall openings, placed at each side of wall openings. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with shoes or by welding, and space jack studs same as full-height studs of the wall. Secure stud system all around to wall opening frame in the manner indicated.
 - I. Install bracing/bridging in accordance with manufacturer's instructions and design conditions.
 - J. Touch up field welds and damaged galvanized coating, except touch up of field cut studs is not required.
 - K. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.
 - L. Install horizontal stiffeners in stud system, space (vertical distance) at no more than 54 inches on center. Weld at each intersection.

3.4 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track:
 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).

2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel stud sections as indicated on shop drawings.
- C. Space joists not more than two inches (51 mm) from abutting walls:
 1. Joist spacing: 16 inches (406 mm).
- D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on shop drawings:
 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on shop drawings. Fasten bridging at each joist intersection as follows:
 1. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold down angles, anchors, and fasteners, to provide a complete and stable joist framing assembly.

END OF SECTION 05 40 00

SECTION 05 52 00 – METAL RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 - 1. Steel pipe and tube railings.
 - 2. Accessories necessary for a complete installation.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - d. Design shall comply with section 1607A.7 of CBC.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C), material surfaces.

1.4 SUBMITTALS

- A. Product Data: Technical data for railings and the following:
 - 1. Railing brackets.
 - 2. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.
- D. Qualification Data: For testing agency.
- E. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

- F. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- G. Evaluation Reports: For post installed anchors, from ICC-ES.

QUALITY ASSURANCE

- H. Regulatory Requirements:
 - 1. Accessibility Requirements: Comply with applicable requirements.
 - a. Americans with Disabilities Act of 1990, as amended.
 - 1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design.
 - b. CBC 2016 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA).
 - 1) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
 - 2) CBC Chapter 10 – Means of Egress.
 - 2. Welding Qualifications: Qualify procedures and personnel according to the following:
 - a. AWS D1.1/D1.1M Structural Welding Code - Steel.
- I. Source Limitations: Obtain each type of railing from single source from single manufacturer.

1.5 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Metal Surfaces: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 - 1. Post Mounted: Refer to drawings.
 - 2. Wall Mounted: Radiused seat to accept handrail and sized to provide minimum 1-1/2 inch clearance between rail and mounting surface.
 - a. Basis of Design: Julius Blum #1382 Cast Iron, Galvanized.

- C. Steel and Iron:
 - 1. Tubing: ASTM A 500 (cold formed) or ASTM A 513.
 - 2. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - a. Provide galvanized finish for exterior installations and where indicated.

 - 3. Plates, Shapes, and Bars: ASTM A 36/A 36M.

- D. Fasteners: Provide the following:
 - 1. Ungalvanized Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 for zinc coating.
 - 2. Hot Dip Galvanized Railings: Type 304 stainless steel or hot dip zinc coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
 - 3. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
 - 4. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

- E. Miscellaneous Materials:
 - 1. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 2. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
 - 3. Galvanizing Repair Paint: High zinc dust content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
 - 4. Shop Primer for Ferrous Metal: Universal primer, organic zinc rich primer, complying with SSPC-Paint 20 and compatible with topcoat. Provide 10-99 (red) or 10-09 (gray) by Tnemec Company.
 - 5. Universal Shop Primer: Fast curing, lead and chromate free, universal modified alkyd primer and compatible with topcoat. Use primer containing pigments that make it easily distinguishable from zinc rich primer.
 - 6. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc coated metal and compatible with finish paint systems indicated.
 - 7. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in steel, complying with SSPC-Paint 20. Provide Tneme-Zinc 90-97 by Tnemec Company.
 - 8. Bituminous Paint: Cold applied asphalt emulsion complying with SSPC-Paint 12, containing no asbestos fibers, or cold applied asphalt emulsion complying with ASTM D 1187 ASTM D 1187/D 1187M.
 - 9. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.2 FABRICATION

- A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with either welded or nonwelded connections as indicated on drawings.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 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 flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Form Changes in Direction:
 - 1. As detailed.
 - 2. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
- J. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.3 FINISHES

- A. Steel and Iron Finishes:
1. Galvanized Railings:
 - a. Hot dip galvanize exterior steel railings, including hardware, after fabrication.
 - b. Comply with ASTM A 123/A 123M for hot dip galvanized railings.
 - c. Comply with ASTM A 153/A 153M for hot dip galvanized hardware.
 - d. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - e. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
 2. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, and other ferrous components.
 3. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
 4. For nongalvanized steel railings, provide nongalvanized ferrous metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.
 5. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with SSPC-SP 3 Power Tool Cleaning.
 - a. Exterior Railings: SSPC-SP 6/NACE No. 3 *Commercial Blast Cleaning*.
 - b. Railings Indicated to Receive Zinc Rich Primer: SSPC-SP 6/NACE No. 3 *Commercial Blast Cleaning*.
 - c. Other Railings: SSPC-SP 3 Power Tool Cleaning.
 6. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 *Shop, Field, and Maintenance Painting of Steel* for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 7. Do not apply primer to galvanized surfaces.
 8. Shop Painted Finish: Comply with Section 099000.
 - a. Color and Gloss: Selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).

- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

- A. Form or core drill holes for installing posts in concrete as indicated on drawings.

3.5 ATTACHING RAILINGS

- A. Attach railings to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- B. Secure wall brackets to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled in expansion shields and hanger or lag bolts.
 - 2. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
 - 3. For steel framed partitions, use self tapping screws fastened to steel framing or to concealed steel reinforcements.

3.6 ADJUSTING AND CLEANING

- A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0 mil (0.05 mm) dry film thickness.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 05 52 00

SECTION 06 10 00 - ROUGH CARPENTRY

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 SECTION INCLUDES

- A. All rough carpentry items including, but not limited to:
 - 1. Wood blocking for support of items supported on or recessed into wood framing or requiring wood blocking for support.
 - 2. Wood cants, nailers, curbs, and other items associated with roofing work.
 - 3. Miscellaneous framing items and plywood sheathing.

1.3 RELATED WORK

- A. All Sections of Work supported on or recessed into wood framing or requiring wood blocking for support, such as wall trim, wall cabinets, handrails, lockers, toilet compartments, toilet and bath accessories, markerboards, tackboards, projection screens, fire extinguisher cabinets, etc., as applicable to the Project.

1.4 SUBMITTALS

- A. Product Data: Manufacturer's data on wood treatment materials.

1.5 STANDARDS AND GRADING

- A. All lumber used structurally and/or for finish trim shall be graded and marked with grade and trademark of a lumber grading organization approved by the Architect, except that a certification of grade from such a grading organization may be accepted in lieu of grade and trademarks when approved by the Architect. Trademark of manufacturer shall also appear on each piece. All Lumber must comply with the California Department of Forestry and Fire Protection Office of the State Fire Marshal, Wildland Urban Interface Products listings and where applicable.
- B. Each piece of plywood used structurally shall carry the American Plywood Association trademark.
- C. Grading Rules: Conform with all applicable requirements of American Lumber Standards "Simplified Practice Recommendations R-16" and to grading rules of manufacturer's association under whose rules the lumber is produced.
- D. Reference Standards: Conform with all requirements.
 - 1. U.S. Dept. of Commerce Product Standards (PS).
 - 2. American Plywood Association (APA).
 - a. Standards and Construction Guide
 - 3. American Wood Preservers Association (AWPA).
 - a. Standards, as they apply.
 - 4. Architectural Woodwork Institute (AWI)
 - a. "Quality Standards."
 - 5. National Woodwork Manufacturers' Association Standard (NWMA).
 - 6. Western Wood Products Association Manual (WWPA).

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Lumber:
- 1 Structural Framing, Douglas Fir of the Grades Indicated on the Structural Drawings. Maximum moisture content 19%, S4S, S-Dry
 - 2 Treated Lumber, Douglas Fir, S-Dry
 - a. Comply with NWMA Standards
 - b. Use for blocking, stripping, grounds, cants and miscellaneous wood items in contact with concrete, roofing, or exposed to the weather.
- B. Plywood:
1. General: Comply with APA Standards.
 2. Roof Sheathing: APA Structural 1, Grade C-D, Exposure 1 minimum 5-ply construction, meeting product Standards PS-1-09.
 3. Wall sheathing: APA Structural I, Grade C-D, Exposure 1 minimum 5-ply construction, meeting product standard PS-1-09.
 4. APA rated Sturdi-floor, exterior grade, tongue and oriented strand board
 - a. OSB sheathing shall comply with division of state architect (DSA) acceptance criteria.
 - b. Roof and wall sheathing APA rated exposure I, Structural I, meeting PS-2 and PRP-108. Nominal thickness 15/32
- C. Rough Hardware:
1. Nails, Spikes, and Staples: Galvanized for exterior locations, high humidity locations, and treated wood; plain finish for other interior locations: Size and type to suit application and as noted on the structural drawings. Do not use nails to resist "pull-out" loads.
 2. Bolts, Nuts, Washers, Lags, and Screws: Medium carbon steel; size and type to suit application. Galvanize for exterior locations, high humidity locations, and treated wood. Plain finish for other interior locations.
 3. Fasteners: Expansion anchors for anchorage to solid masonry and concrete. Bolts or power activated type for anchorage to steel. Refer to structural drawings.
- D. Wood Treatment:
1. Preservative Treatment (Concealed Conditions):
 - a. Micronized Copper Quaternary (MCQ): Pressure impregnate preservative to net retention of 0.25 lbs./cu.ft., in plant licensed by manufacturer in accordance with the following standards:
 - 1) Preservative Treatment Standard: AWPA P5.
 - 2) Structural Lumber Treatment Standard: AWPA C31.
 - 3) Plywood Treatment Standard: AWPA C9.
 - b. Brush two (2) coats of preservative on bored or sawn surfaces of treated lumber.
 - c. Provide Quality Mark Stamp on treated wood for identification.
 - d. Fasteners: Metal fasteners in contact with preservative treated wood shall be G-90 galvanized, minimum, or stainless steel in accordance with manufacturer's instructions. No uncoated steel shall come in contact with preservative wood.
 - e. ACQ and CCA preservatives not permitted.
 - f. Acceptable Manufacturers: Osmose "MicroPro" Smart Sense; or Architect approved equal.
 2. Fire Retardant Treatment:
 - a. Lumber shall be pressure-impregnated with non-combustible fire retardant chemicals in accordance with U.L. FRS Fire Hazard Classification. All lumber must be dried following treatment in accordance with AWPA Standard C20.
 - b. Plywood shall be pressure-impregnated with non-combustible fire retardant chemicals in accordance with U.L. FRS Fire Hazard Classification. All plywood must be dried following treatment in accordance with AWPA Standards C27.

PART 3 - EXECUTION

3.1 Framing

- A. Erect wood framing members level and plumb.
- B. Place horizontal members laid flat, crown side-up.
- C. Construct framing members full length without splices.
- D. Double members at openings over 1 sq ft. Space short studs over and under opening to stud spacing.
- E. Construct double joist headers at floor and ceiling openings. Frame rigidly into joists.
- F. Construct double joists under wall studding.
- G. Bridge joists in excess of 8 feet span at mid-span members. Fit solid blocking at ends of members.

3.2 FURRING, BLOCKING AND GROUNDS

- A. Provide wherever shown and where required for attachment of other work. Coordinate with work of other sections
- B. Item locations include but are not limited to toilet accessories, toilet partitions, door frames, window frames, hardware, access doors and ladders, cabinetry, miscellaneous equipment locations and mechanical, plumbing and electrical item locations and all other locations of wall mounted items.
- C. Install plywood backboards for telephone, data and other electrical equipment.
- D. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
- E. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated.
- F. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finished work.
- G. Firestop all concealed spaces of wood stud walls, ceilings and floor levels at 10 foot intervals both vertically and horizontally.
- H. Firestop all concealed vertical and horizontal spaces as occur at soffits, vents, stair stringers, pipes and similar openings in compliance with CBC,(CCR) Title 24, Part 2, Section 718.
- I. Firestopping shall consist of closely fitted wood blocks of 2 inch nominal thickness lumber of same width as framing members.

3.3 SHEATHING

- A. Secure roof sheathing perpendicular to framing members with ends staggered. Secure sheet edges over firm bearing. Provide solid edge blocking between sheets. Space panels 1/8 inch apart at ends and edges.
- B. Secure wall sheathing perpendicular to wall studs, with ends staggered, over firm bearing.
- C. Install telephone and electrical panel back boards where required. Size of backboards to be 12 inches beyond size of electrical panel boards.

END OF SECTION 06 10 00

SECTION 06 20 00 - FINISH CARPENTRY AND MILLWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Providing all finish carpentry items including, but not limited to:
 - 1. Finish Carpentry
 - 2. Miscellaneous Millwork

1.2 REFERENCES

- A. Codes and References:
 - 1. 2016 California Building Code Section 11B-309.
- B. American National Standards Institute:
 - 1. ANSI A161.1 - Woodwork Testing Standards
- C. Woodwork Institute:
 - 1. WI – North American Architectural Woodwork Standards. (Min 2017 Ed.)

1.3 PERFORMANCE REQUIREMENTS

- A. Unless otherwise indicated, perform work in accordance with WI "Architectural Woodwork Standards", Custom Grade, except where specification exceeds those standards, the more stringent shall govern.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Indicate size, material and finish.
- B. Samples: Two (2) each, 12 inch long x 1/2 inch min thick samples of specified hardwood with stained finish for use as comparison with existing trim.
- C. Closeout:
 - 1. Record Drawings: indicate revisions to original drawings and shop drawings
 - 2. Manufacturer contact names, addresses and phone numbers.
 - 3. Finish Material Schedule: names and color numbers of laminates and stains.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a licensee of WI's Certified Compliance Program.
- B. Installer Qualifications: Licensee of WI's Certified Compliance Program.
- C. Quality Standard: Unless otherwise indicated, comply with WI's "Manual of Millwork" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1.6 PRODUCT HANDLING

- A. Deliver finish carpentry materials only after wet operations in building are completed. Store in ventilated place, protected from the weather, with relative humidity range of 20 to 50 percent.
- B. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.

1.7 JOB CONDITIONS

- A. Environmental Requirements: Do not install finish carpentry until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least one (1) week.
 - 1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.
 - 2. After installation, control temperature and humidity to maintain relative humidity between 25 and 55 percent.

1.8 WARRANTY

- A. Warranty the work specified herein for five (5) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
- B. Defects shall include, but not be limited to the following:
 - 1. Rough or difficult operation, or loose or missing parts.
 - 2. Delamination of surfaces.
 - 3. Noticeable deterioration of finish.
 - 4. Warped or misaligned surfaces or telegraphing of subsurface imperfections.

PART 2 PRODUCTS

2.1 MILLWORK MANUFACTURERS

- A. Woodwork Institute listed Accredited Millwork Companies 2018 Roster and shall not preclude the Contractor from using other manufacturers, provided they produce equivalent products of the type specified for the scope and size of the Project. Other manufacturers must have experience manufacturing products meeting or exceeding the specifications and must comply with the criteria specified in paragraph 1.6 above and with Division 01 requirements regarding substitutions.

2.2 SOLID STOCK

- A. Moisture Content: Percent of moisture in relation to over-dry weight shall be between 8 percent and 13 percent at time of installation.
- B. Natural Finish Hardwood:
 - 1. Occasional knot permitted provided it is tight and smooth.
 - 2. Grain Pattern: Rift-cut
 - 3. Species: WI "Premium" Grade, Oak. Species to match existing on site.
- C. Paint Grade Hardwood: Any species, including Parana Pine, except do not use Oak, Elm or similar species which have coarse grain.

PART 3 EXECUTION

3.1 MILLWORK INSTALLATION

- A. Positioning: Place approximately level, plumb and at right angles to adjacent work.
- B. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging the products and adjacent work.
- C. Anchorage: Attach securely so the products will perform to their maximum ability without damage from inadequate fastenings.

END OF SECTION 06 20 00

SECTION 06 40 00 ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Plastic laminate cabinets.
 - 2. Plastic laminate and solid surface countertops.
 - 3. Plastic laminate panels.
 - 4. Standing and running trim
 - 5. Closet and utility shelving
 - 6. Shop finishing.
 - 7. Accessories necessary for a complete installation.
- B. Related Sections:
 - 1. Section 06 10 00: Rough Carpentry.
 - 2. Section 06 20 00: Finish Carpentry.
 - 3. Section 09 90 00: Painting and Coating.
 - 4. Section 12 35 50: Educational/Library Casework.

1.3 DEFINITIONS

- A. Architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Technical data for each type of product indicated including cabinet hardware and accessories:
 - a. Include data for fire retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings:
 - 1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components:
 - a. Show details full size.
 - b. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - c. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, and other items installed in architectural woodwork.
- C. Samples:
 - 1. Lumber with or for transparent finish, not less than 5 inches (125 mm) wide by 24 inches (600 mm) long, for each species and cut, finished on 1 side and 1 edge.
 - 2. Veneer faced panel products with or for transparent finish, 8 inches by 10 inches (200 by 250 mm), for each species and cut. Include at least one face veneer seam and finish as specified.

3. Lumber and panel products with shop applied finish, 50 sq. in. (300 sq. cm) for lumber and 8 inches by 10 inches (200 mm by 250 mm) for panels, for each finish system and color, with 1/2 of exposed surface finished.
 4. Plastic laminates, 8 inches by 10 inches (200 mm by 250 mm), for each type, color, pattern, and surface finish and specified edge material applied to 1 edge.
 5. Quartz surfacing materials, 6 inch square.
 6. Corner pieces:
 - a. Cabinet front frame joints between stiles and rails, as well as exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
 7. Exposed cabinet hardware and accessories, one unit for each type and finish.
- D. Qualification Data: For Fabricator/Installer.
- E. Woodwork Quality Standard Compliance Certificates: WI Quality Certification Program certificates (CCP).

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. Building Code: Comply with applicable requirements of CBC Chapter 8 for Interior Finishes.
 2. Accessibility:
 - a. 2019 California Building Code; Section 11B-309 for Casework, Section 11B-404 Doors and Hardware and Section 11B-703 for Signage (where applicable).
 - b. American Disabilities Act Accessibility Guidelines (ADAAG) for Buildings and Facilities; Final Guidelines and revisions.
 3. Quality Standard: Unless otherwise indicated, comply with WI, *Woodwork Institute*, for premium grade architectural woodwork indicated for construction, finishes, installation, and requirements. Provide certified compliance labels and certificates indicating woodwork, including installation, complies with requirements of grades specified.
 4. Fire Test Response Characteristics: Where fire retardant materials or products are indicated, provide materials and products with specified fire test response characteristics determined by testing identical products per test method indicated by UL. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
- B. Fabricator Qualifications: Shop having minimum 5 years documented experience who employs skilled workers who custom fabricate products similar to those required and who is a participating member of WI.
- C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence matched wood veneers and transparent finished wood doors that are required to be of same species as woodwork.
- D. Quality Standard: Unless otherwise indicated, comply with North American Architectural Woodwork Standards, meeting or exceeding ANSI A161.1, for grades of architectural woodwork indicated for construction, finishes, installation, and requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork is completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Provide materials that comply with requirements of WI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Products:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium Density Fiberboard - ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde; minimum 48 pcf density except that minimum for screw holding capacity on face shall be 300 pounds; minimum 3/4 inches (19 mm) thick, edged and faced as specified:
 - a. Arauco; Trupan MDF, VESTA Technology.
 - b. Roseburg Forest Products, Inc.; Roseburg MDF products.
 - c. Approved Equal.
 - 3. Particleboard: Unless otherwise noted by District, particleboard is not to be used.
 - 4. Softwood Plywood: DOC PS 1, Medium Density Overlay.
- C. Lumber:
 - 1. Comply with applicable provisions for grading and workmanship of WI Quality Standards, and requirements specified. Provide lumber surfaced 4 sides (S4S) and fabricated to profiles shown. Kiln dry lumber to 19% moisture content:
 - a. Furring, Blocking, Shims: No. 1 Common; Southern Pine.
 - b. Solid Hardwood for Opaque Finish: Plain sawn Yellow Poplar, free from checks, splits, sound knots.
- D. Thermoset Decorative Panels:
 - 1. Particleboard or medium density fiberboard finished with thermally fused, melamine impregnated decorative paper complying with LMA SAT-1:
 - a. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semi-exposed edges.
- E. High Pressure Decorative Laminate - NEMA LD 3, grade indicated or as required by woodwork quality standard:
 - 1. Manufacturer is subject to compliance with requirements; provide high pressure decorative laminates by one of the following:
 - a. Abet Laminati, Inc.
 - b. Formica Corporation.
 - c. Panolam Surface Systems by Panolam Industries International Incorporated.
 - d. Wilsonart LLC.

2.2 FIRE RETARDANT TREATED MATERIALS

- A. Where fire retardant treated materials are indicated, use materials complying with requirements are acceptable to authorities having jurisdiction, and with fire test response characteristics specified:
1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or defective.
 2. Use fire retardant treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 3. Identify fire retardant treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Fire Retardant Particleboard:
1. Panels complying with requirements, made from softwood particles and fire retardant chemicals mixed together at time of panel manufacture to achieve flame spread index of 25 or less and smoke developed index of 50 or less per ASTM E84:
 - a. For panels 3/4 inch 19 mm thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi11 MPa; modulus of elasticity, 300,000 psi2070 MPa; internal bond, 80 psi550 kPa; and screw-holding capacity on face and edge, 250 and 225 lbf1100 and 1000 N, respectively.
 - b. For panels 13/16 inch to 1-1/4 inches 20 to 32 mm thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi9 MPa; modulus of elasticity, 250,000 psi1720 MPa; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf1100 and 780 N, respectively.
 - c. Product: Subject to compliance with requirements, provide Duraflake FR by Arauco.
- C. Fire Retardant Fiberboard: Medium density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire retardant chemicals mixed together at time of panel manufacture to achieve flame spread index of 25 or less and smoke developed index of 200 or less in accordance with ASTM E84.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers of items referenced to this standard. Provide cabinet hardware and accessory materials associated with architectural cabinets.
- B. Frameless Concealed Hinges (European Type) - BHMA A156.9, B01602, self-closing:
1. Provide 170 degree minimum opening capabilities. For end doors perpendicular to walls, provide 90 degree type.
 2. For doors 32 inches high or less, provide 2 pair of hinges, add 1/2 pair for every additional 20 inches.
 3. Products are subject to compliance with requirements; provide from one of the following:
 - a. Hafele North America Co.
 - b. Julius Blum, Inc.
 - c. Mepla-Alfit, Inc.
- C. Wire Pulls: Back mounted, solid metal, 5 inches (127 mm) long, 2-1/2 inches (63.5 mm) deep, and 5/16 inch (8 mm) in diameter.

- D. Catches - Magnetic, complying with BHMA A156.9 and B03161:
 - 1. Rockwood 901 by Assa Abloy.
 - 2. Comparable product.
- E. Cabinet Shelf Rests - Nickel plated 7 mm diameter shelf support pegs in brass sockets, complying with BHMA A156.9, B04013:
 - 1. Hafele 282.01.701 x 282.50.704 or comparable product.
- F. Closet Rods and Flanges: 1-1/2 inch diameter, satin finished chrome plated steel or satin finished stainless steel with matching end flanges.
- G. Adjustable Shelf Standards and Brackets for Wall Hung Open Shelving - BHMA A156.9, B04071; with shelf rests, B04081:
 - 1. Standards: Model No. 87ANO Super Duty 87/186/187 Steel Series; lengths as indicated, by Knappe & Vogt or comparable product.
 - 2. Brackets: Model No. 187 LL ANO 12 to 24 for 12 inch to 24 inch (300 mm to 600 mm) deep shelves by Knappe & Vogt or comparable product.
 - 3. Shelf Rests: Model No. 210 ANO End Rest and Model No. 211 ANO Center Rest with Model No. 129 RUB Rubber Cushions or comparable product.
- H. Shelf Rests: BHMA A156.9, B04013; metal, two pin type with shelf hold down clip.
- I. Silencers: Provide rubber silencers on jamb and/or head and sill strike areas of all cabinet doors and drawers, 2 for paired doors, and 3 for single doors. Size: Approximately 1/4 inch (6.4 mm) diameter. Color: Compatible with adjacent finish.
- J. Drawer Slides - BHMA A156.9, B05091:
 - 1. Provide positive stop, self-closing side mounted, full extension, zinc plated steel drawer slides with steel ball bearings:
 - a. Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches (75 mm) high and 24 inches (600 mm) wide; Accuride 2006 having 3/4 extension carburized steel ball bearing, side mounting, 45 lbs. capacity medium duty load rating, cold rolled steel slide members and ball retainers, bright electro zinc plate finish.
 - b. Box Drawers (Less than 8 inches Deep): Grade 1HD-100; for drawers not more than 6 inches 150 mm high and 24 inches 600 mm wide; Provide Accuride 7432; up to 24 inches wide, full extension carburized steel ball bearing, side mounting, minimum 100 lb capacity medium duty load rating, cold rolled steel slide members and ball retainers, cushioned in and out stops, detent-in, progressive action, positive stop, bright electro zinc plate finish.
 - c. Pedestal Drawers (Greater than 8 inches Deep): Accuride 4032; up to 24 inches wide, full extension carburized steel ball bearing, rail mounting, minimum 150 lb capacity heavy duty load rating, cold rolled steel slide members and ball retainers, cushioned in and out stops, detent-in, progressive action, positive stop, bright electro zinc plate finish.
 - d. Lateral File Drawer Slides: For drawers more than 6 inches (150 mm) high or 24 inches (600 mm) wide; heavy-duty, up to 42 inches wide, 3640 series by Accuride.
 - e. Keyboard Slide: Model No. 2109, color black by Accuride, Inc.
 - f. Refuse Cabinets: Accuride 3600-201D, full extension carburized steel ball bearing, bottom mounting, heavy-duty, cold rolled steel slide members and ball retainers, cushioned in and out stops, progressive action, positive stop, bright electro zinc plate finish.

- K. Door and Drawer Locks:
1. Provide locks for each cabinet door and drawer as indicated on drawings. Finish exposed portions of locks to match cabinet pull finish. Furnish 2 keys with each lock and key locks inside one room alike and provide masterkey for locks in project. Selections to meet BHMA A156.11 and E07041 (for drawers) or E07121 (for doors):
 - a. Cam lock similar to Hafele 235.20.20x, chrome plated, with Offset Cam 219.13.9xx, sized to fit opening.
 - b. Cam lock similar to Hafele 235.20.20x, chrome plated, with surface mounted strike 251.60.703.
 - c. Pairs of Doors:
 - 1) Inactive Leaf: Furniture bolt similar to Hafele 252.02.644, polished chrome, with strike 251.60.703.
 - 2) Active Leaf: Single door lock assembly.
- L. Grommets for Cable Passage through Countertops:
1. 2 inch (51 mm), black, molded plastic grommets and matching plastic caps with slot for wire passage:
 - a. Product: Subject to compliance with requirements, provide TG series by Doug Mockett & Company, Inc.
- M. Trash Grommet Through Countertop: TM1B, 6-inch x 2-inch polished stainless-steel grommet by Doug Mockett and Co., Inc.
- N. Exposed Hardware Finishes:
1. For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated:
 - a. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
- O. Concealed Hardware: Provide finish complying with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire retardant treated softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot dip galvanized anchors and inserts on inside face of exterior walls and as required for corrosion resistance. Provide toothed steel or lead expansion sleeves for drilled in place anchors.
- C. Hanging (Zee Clip) Strips: Extruded aluminum zee type interlocking clips; type, size and quantity for the condition of use.
- D. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.
- E. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
- F. Blind Splines: Specialty devices, as required for tight butt joining, types and size as recommended by woodwork fabricator.

- G. Covercaps: Where mortises of fastener heads, or draw downs are exposed (blind holes) in finished work, provide black plastic covercaps.
- H. Adhesive for Bonding Plastic Laminate:
 - 1. Resorcinol:
 - a. Adhesive for Bonding Edges: Hot melt adhesive.
- I. Stone Seam Adhesive:
 - 1. 2-part, epoxy resin stone adhesive with an initial set time of not more than 2 hours at 70 degrees F (21 degrees C), and with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Color: Clear.
 - b. Products: Subject to compliance with requirements, provide Bonstone Materials Corporation; Duproxi, or Akemi North America; Akepox.
- J. Stone Sealer:
 - 1. Colorless, nonstaining, single component, neutral curing silicone sealant that does not affect color or physical properties of stone surfaces, recommended by stone producer for application indicated. Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. Custom Building Products.
 - c. Hillyard, Inc.
- K. Stone Cleaner: Cleaner specifically formulated for stone types, finishes, and applications indicated, recommended by stone producer and by sealer manufacturer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.

2.5 FABRICATION

- A. Woodwork Grade:
 - 1. WI Custom Grade woodwork complying with referenced quality standard:
 - a. Complete fabrication, including assembly, finishing, and hardware application, before shipment to site to the maximum extent possible. Disassemble components as necessary for shipment and installation. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting. The width of scribe and filler panels shall not exceed 1/2 inch or 1/2 inch clear dimension from adjacent wall to outside face of cabinet door in a 90 degree position, whichever is greater.
 - b. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Sand fire retardant treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid Wood (Lumber) Members 3/4 Inch (19 mm) Thick or Less: 1/16 inch (1.5 mm).

2. Corners of Cabinets and Edges of Solid Wood (Lumber) Members 3/4 Inch (19 mm) Thick or Less: 1 1/2 Inch (38 mm).
 3. Corners of Cabinets and Edges of Solid Wood (Lumber) Members and Rails: 1/16 inch (1.5 mm).
- E. Shop cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs:
1. Seal edges of openings in countertops with a coat of varnish.
- F. Plastic Laminate Faced Wood Paneling - WS Premium Grade:
1. Plastic Laminate - High pressure decorative laminate complying with NEMA LD 3:
 - a. Faces: Grade SGF.
 - b. Backs: Grade BKH.
 - c. Exposed Edges: Same as faces.
 2. Colors, Patterns, and Finishes:
 - a. Wood grains, matte finish:
 - 1) Grain Direction: Vertical.
 3. Panel Core - Particleboard or medium density fiberboard:
 - a. Thickness: 3/4 inch (19 mm).
 4. Exposed Panel Edges:
 - a. Applied solid wood banding 11/16 inch (18 mm) thick by depth of panels.
 5. Adhesive for Bonding Edges: Hot melt adhesive or adhesive for faces.
 6. Assemble panels by gluing and concealed fastening.
- G. Plastic Laminate Cabinets - WS Premium grade.
1. WI Type of Cabinet Construction: Flush overlay.
 2. Materials:
 - a. Laminate Cladding for Exposed Surfaces - High pressure decorative laminate:
 - 1) Horizontal Surfaces Other Than Tops: Grade HGS.
 - 2) Postformed Surfaces: Grade HGP.
 - 3) Vertical Surfaces: Grade VGS.
 - 4) Edges: Grade HGS.
 - b. Semiexposed Surfaces:
 - 1) Surfaces Other Than Drawer Bodies - Thermoset decorative panels:
 - a) Edges of Plastic Laminate Shelves: Grade HGS, matching laminate in color, pattern, and finish.
 - b) For semiexposed backs of panels with exposed plastic laminate surfaces, provide surface of high pressure decorative laminate, Grade VGS.
 - 2) Drawer Sides and Backs: Solid hardwood lumber.
 - 3) Drawer Bottoms: Hardwood plywood.
 - c. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High pressure decorative laminate, Grade BKL.
 3. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces indicated in Finish Schedule.
 4. Provide dust panels of 1/4 inch 6.4 mm plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

5. Fabrication:
 - a. Join case body members using concealed dado or dowel methods utilizing glue and pressure. Reinforce dado method with nailing or screws. Mechanical fasteners are not permitted:
 - 1) Base Cabinet Bottoms and Subtops: Bottoms, 3/4 inch particleboard with low pressure laminate finish on interior side and phenolic backing sheet on concealed side. Subtops, 3/4 inch particleboard with phenolic backing sheet both sides. Fabricate all base cabinets with subtops.
 - 2) Wall Cabinet Tops and Bottoms: Tops, 1 inch particleboard with low pressure laminate finish on interior side and phenolic backing sheet on concealed side. Bottoms, 1 inch particleboard with manufacturer's low pressure laminate finish both sides.
 - 3) Cabinet Ends: 3/4 inch particleboard with low pressure laminate finish on interior side and phenolic backing sheet on concealed side. Install high pressure plastic laminate on exposed sides of cabinet ends.
 - 4) Cabinet Backs - 1/4 inch hardboard with low pressure laminate finish for standard unexposed backs:
 - a) Fabricate with continuous hot melt glue joint between sides, tops, bottoms, and back on concealed side.
 - b) Exposed Backs: 3/4 inch particleboard with low pressure laminate finish on interior side and high pressure plastic laminate on exterior, exposed side.
 - 5) Cabinet Shelves (Adjustable, Semiconcealed): 3/4 inch particleboard with low pressure laminate finish on both sides. Provide 1 inch particleboard for shelves for unsupported spans over 36 inches.
 - 6) Cabinet Doors: 3/4 inch particleboard with high pressure plastic laminate on exterior side and heavy gauge balancing sheet on interior side.
 - 7) Drawer Fronts: 3/4 inch particleboard with high pressure plastic laminate on exterior side and heavy gauge balancing sheet on interior side.
 - 8) Drawer Construction - 1/2 inch solid hardwood back, sides and subfront; tongued and dadoed into back and subfront, joints glued and pinned; 1/4 inch hardboard bottom tongued and dadoed in all four sides, back, and subfront. Provide additional support with continuous hot melt glue joint on underside of drawers between sides, back, subfront and bottom:
 - a) Reinforce drawer bottoms as required with spreaders.
 - b) Apply drawer front to subfront in accordance with manufacturer's standard procedures.
 - c) Dividers: 3/4 inch particleboard with manufacturer's low pressure laminate finish on both sides. Secure to inside of cabinet with manufacturer's standard plastic clips.
 - d) Dust Panels: Provide dust panels of 1/4 inch plywood or tempered hardboard above compartments and drawers except where located directly under tops.
 - e) Finish exterior exposed surfaces with high pressure plastic laminate. Laminate plastic to particleboard core with balancing sheet using urea resin formaldehyde glue. Fabricate using cold press method with regulated pressure for minimum 8 hours at minimum 70 degrees F.
- H. Countertops - WI Premium Grade:
 1. Solid Surface:
 - a. Solid Surfacing Material Thickness: 3/4 inch (19 mm).
 - b. Colors, Patterns, and Finishes: Provide materials and products resulting in colors of solid surfacing material indicated on drawings.

2. Quartz Countertops:
 - a. Seams:
 - 1) Fabricate countertops without seams to the extent possible. When seams are necessary, fabricate countertops in sections indicated for joining in field, with sealant filled seams 1/16 inch (1.5 mm) in width.
 - b. Fittings: Drill countertops in shop for fittings and similar items.
 - c. Fabricate with 4 inch backsplashes. Sand minor scratches and stains with #400 the #600 sandpaper.
3. Fabrication:
 - a. Fabricate tops in one piece, unless otherwise indicated. Comply with solid surfacing material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing:
 - 1) Fabricate tops with shop applied edges of materials and configuration indicated.
 - 2) Fabricate tops with loose backsplashes for field application.
 - b. Drill holes in countertops for plumbing fittings and soap dispensers in shop.
4. Countertop Construction Tolerances:
 - a. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/16 inch in 48 inches (1.5 mm in 1200 mm).
 - b. Variation from Level: Do not exceed 1/8 inch in 96 inches (3 mm in 2400 mm), 1/4 inch (6 mm) maximum.
 - c. Variation in Joint Width: Do not vary joint thickness more than 1/4 of nominal joint width.
 - d. Variation in Plane at Joints (Lipping): Do not exceed 1/64 inch (0.4 mm) difference between planes of adjacent units.
 - e. Variation in Line of Edge at Joints (Lipping): Do not exceed 1/64-inch (0.4-mm) difference between edges of adjacent units, where edge line continues across joint.

2.6 SHELVING

- A. Closet and Utility Shelving:
 1. Grade: WI Custom.
 2. Shelf Material: 3/4 inch 19 mm medium density fiberboard with solid lumber edge.
 3. Cleats: 3/4 inch (19 mm) solid lumber.

2.7 SHOP FINISHING

- A. Grade: WI Premium grade.
- B. Shop finish architectural woodwork at fabrication shop. Defer final touchup, cleaning, and polishing until installation.
- C. Produce finish architectural woodwork at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.
- D. Preparations for Finishing:
 1. Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work:
 - a. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end grain surfaces. Concealed surfaces of plastic laminate clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.

- E. Exposed Surfaces - WI Premium Grade:
 - 1. Plastic Laminate Finish: Use hot plate method for gluing of plastic laminate surfacing materials; glued surfaces shall be in close contact throughout. Glue stains are not permitted.
 - 2. Solid Surfacing Finish: As scheduled.
- F. Unexposed Wood Finish: Water based alkyd type primer/sealer.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements:
 - 1. Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work:
 - a. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
 - b. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

3.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork will be supported and installed as indicated.

3.3 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas. Before installing architectural woodwork, examine shop fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.4 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for grade specified for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches 3 mm in 2400 mm. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

- C. Fire Retardant Treated Wood: Handle, store, and install fire retardant treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails [or finishing screws] for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- E. Plastic Laminate Paneling:
 - 1. Install paneling to comply with same grade as paneling to be installed:
 - a. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm). Install with no more than 1/16 inch in 96 inch (1.6 mm in 2400 mm) vertical cup or bow and 1/8 inch in 96 inch (3 mm in 2400 mm) horizontal variation from a true plane.
 - b. Anchor paneling to supporting substrate with blind nailing. Do not use face fastening unless covered by trim.
- F. Cabinets:
 - 1. Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated:
 - a. Install cabinets with no more than 1/8 inch in 96 inch (3 mm in 2400 mm) sag, bow, or variation from a straight line.
 - b. Maintain veneer sequence matching of cabinets with transparent finish.
 - c. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer head screws sized for 1 inch 25 mm penetration into wood framing, blocking, or hanging strips or toggle bolts through metal backing or metal framing behind walls.
- G. Countertops:
 - 1. Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop:
 - a. Install countertops with no more than 1/8 inch in 96 inch (93 mm in 2400 mm) sag, bow, or variation from a straight line.
 - b. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
 - c. Caulk space between backsplash and wall with silicone sealant.
- H. Solid Surface and Stone Countertop:
 - 1. Install components plumb and level scribed to adjacent finishes. Fabricate with backsplashes. Sand minor scratches and stain:
 - a. Align adjacent stone and solid surfacing material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - b. Do not cut in field unless otherwise indicated. If countertops or splashes require additional fabrication not specified to be performed at site, return to fabrication shop for adjustment.
 - c. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.

- d. Set stone and solid surface materials to comply with requirements indicated on Drawings and Shop Drawings. Shim and adjust to locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances. Install anchors and attachments indicated or necessary to secure countertops in place.
 - e. Where backsplash is indicated, install backsplash and end splash by adhering to wall with water-cleanable epoxy adhesive and to countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
 - f. Adhesive top mount sinks/bowls to countertops using manufacturer's recommended adhesives and color matched silicone sealants.
 - g. Keep components clean during installation. Remove adhesives, sealants, and stains. Replace stained components.
 - h. Apply sealant to joints and gaps; comply with Section 07 92 00. Remove temporary shims before applying sealant.
 - i. Make plumbing connections to sinks in accordance with plumbing requirements.
 - j. Protect surfaces from damage. Repair work or replace damaged work that cannot be repaired to Architect's satisfaction.
- I. Closet and Utility Shelving:
1. Cut shelf cleats at ends of shelves about 1/2 inch (13 mm) less than width of shelves and sand exposed ends smooth:
 - a. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled. Space fasteners maximum 16 inches (400 mm) o.c.
 - b. Install shelf brackets according to manufacturer's written instructions, spaced maximum 36 inches (900 mm) o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
 - c. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners maximum 12 inches (300 mm) o.c.
 - d. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced maximum 36 inches (900 mm) o.c. and within 6 inches (150 mm) of end of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
 - e. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports:
 - 1) Fasten shelves to cleats with finish nails or trim screws, set flush.
 - 2) Fasten shelves to brackets to comply with bracket manufacturer's written instructions.
- J. Touch up finishing work. Fill nail holes with matching filler where exposed.
- K. Construction Tolerances:
1. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/16 inch in 48 inches (1.5 mm in 1200 mm).
 2. Variation from Level: Do not exceed 1/8 inch in 96 inches (3 mm in 2400 mm), 1/4 inch (6 mm) maximum.
 3. Variation in Joint Width: Do not vary joint thickness more than 1/4 of nominal joint width.
 4. Variation in Plane at Joints (Lipping): Do not exceed 1/64 inch (0.4 mm) difference between planes of adjacent units.
 5. Variation in Line of Edge at Joints (Lipping): Do not exceed 1/64 inch (0.4 mm) difference between edges of adjacent units, where edge line continues across joint.

3.5 SITE ENVIRONMENTAL PROCEDURES

- A. Indoor Air Quality: Provide temporary ventilation during work.
- B. Waste Management:
 - 1. Comply with requirements of Section 01 74 19: Construction Waste Management and Disposal:
 - a. Select wood sizes to minimize waste; reuse scrap to the greatest extent possible. Clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
 - b. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
 - c. Prevent saw dust and wood shavings from entering the storm drainage system.
 - d. Do not burn scrap lumber that has been pressure treated.
 - e. Do not send lumber treated with pentachlorophenol, CCA, or ACA to cogeneration facilities or waste to energy facilities.

3.6 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop applied finishes to restore damaged or soiled areas.
- D. Countertops:
 - 1. Clean countertops as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately. Remove and replace countertops that are:
 - a. In Progress Cleaning: Clean countertops as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.
 - b. Remove and replace countertops that are:
 - 1) Broken, chipped, stained, or otherwise damaged. Stone may be repaired if methods and results are approved by Architect. Repair solid surface in accordance with manufacturer recommendations when approved by Architect.
 - 2) Defective countertops.
 - 3) Defective joints, including misaligned joints.
 - c. Replace complying with requirements and showing no evidence of replacement.
- E. Stone: Clean stone countertops not less than six days after completion of sealant installation, using clean water and soft rags. Do not use wire brushes, acid type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage stone.
- F. Stone Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's written instructions.

3.7 PROTECTION

- A. Provide final protection and maintain conditions, acceptable to manufacturer and Installer, ensuring woodwork is without damage or deterioration at time of Substantial Completion.

END OF SECTION 06 40 00

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 - 1. Glass fiber blanket.
 - 2. Accessories necessary for a complete installation.

1.3 RELATED SECTIONS

- A. Section 09 21 16 - "Gypsum Board Assemblies."
- B. Section 09 51 00 - "Acoustical Ceilings."

1.4 SUBMITTALS

- A. Product Data: Technical data and installation instructions for each type of insulation product specified.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Fire Performance Characteristics: Identify products with appropriate markings of applicable testing and inspecting organization.
 - a. Surface Burning Characteristic: ASTM E 84.
 - 1) Flame Spread Index: Maximum 25.
 - 2) Smoke Developed Index: Maximum 450.
 - b. Fire Resistance Ratings: ASTM E 119.
 - c. Combustion Characteristics: ASTM E 136.
 - 2. National Fire Prevention Association (NFPA) 255 Test of Surface Burning Characteristics of Building Materials.
 - 3. Underwriter's Laboratories (UL) 723 Tests for Surface Burning Characteristics of Building Materials.
- B. Single Source Responsibility for Insulation Products: Obtain each type of building insulation from single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of work.
- C. Environmental Requirements: Manufacture extruded polystyrene with HCFC or other CFC free blowing agents. Mark insulation boards and packages with manufacturer's name and product designation. Unmarked boards and packages will be rejected.
 - 1. Wherever possible, provide boards from manufacturers who recycle insulation materials.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

1.7 PROJECT CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.
- B. Sequence work to ensure fireproofing and firestop materials are in place before beginning work.

PART 2 - PRODUCTS

2.1 ACOUSTICAL INSULATION (SOUND ATTENUATION)

- A. Acoustical Insulation (Sound Attenuation), Unfaced: ASTM C 612, Type I. with maximum flame spread and smoke developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Guardian Building Products, Inc.
 - c. Johns Manville; a Berkshire Hathaway company.
 - d. Knauf Insulation.
 - e. Owens Corning.
 - 2. Thickness/R- Values (minimum):
 - a. 3-1/2 inches/ R-11 at 2x4 framing conditions, typical.
 - b. 6 inches/ R-19 at 2x6 framing conditions, typical.
 - c. Insulation thickness shall match full depth of wall cavity unless noted otherwise.
 - 3. Location: As noted on the drawings

2.2 GLASS FIBER BLANKET

- A. Glass Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame spread and smoke developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Guardian Building Products, Inc.
 - c. Johns Manville; a Berkshire Hathaway company.
 - d. Knauf Insulation.
 - e. Owens Corning.
- B. Glass Fiber Blanket, Polypropylene Scrim Kraft Faced: ASTM C 665, Type II (non-reflective faced), Class A (faced surface with a flame spread index of 25 or less); Category 1 (membrane is a vapor barrier).
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.

- c. Knauf Insulation.
- d. Owens Corning.

2.3 POLYISOCYANURATE FOAM PLASTIC BOARD

- A. Rigid Insulation: HCFC-free, ASTM C1289, Type II, Class 1, Grade 3, polyisocyanurate foam insulation. Furnish flat and tapered boards as required to build-up roof slopes indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Atlas Roofing Corporation
 - b. Hunter XCI
 - c. Dow Chemical Company
 - d. Owens Corning
 - e. Firestone Building Products
 - f. Rmax, Inc.
 - 2. Tapered Boards: 1/4 inch minimum slope unless noted otherwise.
 - 3. Cover Board: 1/4 inch minimum thickness per manufacturer recommendations for proposed roofing system.
 - 4. Location: HVAC Roof Platforms as identified on the drawings.

2.4 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame spread and smoke developed indexes of 5, per ASTM E 84.
 - 2. 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, and shall conform to all SCAQMD and EPA air quality regulations.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.
- B. Foam in Place Insulation: Verify that substrates are clean, dry, and free of substances that are harmful to insulation.
 - 1. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Roofing Insulation: Install insulation in accordance with manufacturer's directions. Install blankets straight and true in one-piece lengths with both sets of tabs sealed to provide a complete vapor barrier. Locate insulation on underside of roof sheets, extending across the top flange of purlin members and held taut and snug to roofing panels with retainer clips. Install retainer strips at each longitudinal joint, straight and taut, nesting with roof rib to hold insulation in place.

- C. Batt Insulation: Install insulation that is undamaged, dry, and unsoiled and has not been exposed to ice, rain, or snow at any time.
 - 1. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
 - 2. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

- D. Framed Construction: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
 - 5. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - a. Glass Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
 - b. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
 - 6. Locations:
 - a. Provide faced insulation where thermal insulation is required between conditioned spaces and exterior.
 - b. Provide unfaced insulation where sound insulation is required between interior spaces.

3.3 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 92 00 – JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 1. Control and expansion joints on exposed interior and exterior surfaces.
 2. Perimeter joints between wall surfaces and frames of interior and exterior doors and openings.
 3. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 4. Joints indicated or as necessary.
 5. Accessories necessary for a complete installation.

1.3 RELATED SECTIONS

- A. Section 03 30 00: Cast-In-Place Concrete
- B. Section 05 50 00: Metal Fabrications.
- C. Sections 08 Series: Doors.
- D. Section 08 80 00: Glazing.

1.4 SUBMITTALS

- A. Product Data: Technical data for each joint sealant product. Data to indicate elasticity and durability of each joint sealant product. Submit written certification from manufacturers of sealants attesting products are suitable for use indicated, verified through in house testing laboratory.
 1. Written certification from manufacturers of joint sealants attesting that products comply with specification requirements and suitable for use indicated verified through manufacturers testing laboratory within the past 36 months or since most recent reformulation, whichever is most recent.
 - a. Complete instructions for handling, storage, mixing, priming, installation, curing and protection of each type of sealant.
 - b. Manufacturer's letter, clearly indicating proposed lot numbers of each sealant supplied and expiration date sequence.
 - c. Instructions for handling, storage, mixing, priming, installation, curing, and protection of each type of sealant.
 2. VOC Data: Submit manufacturer's product data for sealants. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.
 3. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.
- B. Samples:
 1. Provide color samples from full manufacturer's full range for each type of sealant specified for Architect's review.

- C. Certificates and Reports:
1. Product Certificates: Manufacturer's product certificate for each kind of joint sealant and accessory.
 2. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
 3. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
 4. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - a. Materials forming joint substrates and sealant backings have been tested for compatibility and adhesion with sealants.
 - b. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
 5. Preconstruction Field Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified.
 6. Field Adhesion Test Reports: For each sealant application tested.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Firm having minimum 5 years documented experience and specializes in the installation of sealants.
1. Exposed sealant work (sealants used for air and weatherseals external at perimeter, metal panel to panel joints) shall be performed by a single (i.e. one) firm specializing in the installation of sealants who has successfully produced work comparable to project.
 2. Concealed sealant work (sealants which are internal to skylights, and providing an air seal) shall be the responsibility of the subcontractor providing erection of the respective system.
- B. Source Limitations: Obtain each type of joint sealant from a single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 2. Test according to SWRI Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion in peel, and indentation hardness.
- D. Environmental Requirements:
1. Toxicity/IEQ: Comply with applicable regulations regarding toxic and hazardous materials.
 - a. VOC Content of Interior Sealants: Sealants and sealant primers complying with limits for VOC content for SCAQMD when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1) Sealants: 250 g/L.
 - 2) Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3) Sealant Primers for Porous Substrates: 775 g/L.
 - b. Sealants containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds, are not permitted.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

- B. Store and handle materials in compliance with manufacturer written instructions to prevent deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 degrees F (4.4 degrees C).
 - 2. When joint substrates are wet. Should joints or backing materials become wet, remove and replace backing material with new.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 WARRANTY

- A. Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealant work which has failed to provide a weathertight system within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- B. Warranties: Written warranties (weatherseal and stain resistance), signed by sealant manufacturer agreeing to furnish joint sealants to repair or replace those that fail to provide airtight and watertight joints, or fail in adhesion, cohesion, abrasion resistance, stain resistance, weather resistance, durability, or appear to deteriorate in manner not specified in the manufacturer's data as an inherent quality of the material within specified warranty period.
 - 1. Warranty Period: 5 years from date of Substantial Completion.
- C. Warranties specified exclude deterioration or failure of sealants from:
 - 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Compatibility: Provide joint sealants, backings, and related materials compatible with one another and with joint substrates under conditions of service and application, as stated by sealant manufacturer's published data, and as substantiated by the manufacturer for each application through testing.
- B. Liquid Applied Sealants: Comply with ASTM C 920 and requirements indicated for each liquid applied sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

- C. Stain Test Response Characteristics: For sealants in contact with porous substrates, provide nonstaining products that have undergone testing according to ASTM C 1248 and do not stain porous joint substrates.
- D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Colors: For fully concealed joints, provide standard color of sealant that has the best overall performance characteristics for the application shown. For exposed joints, submit color samples to architect for approval, from manufacture's full line of standard colors.
- F. Manufacturer's Representative: Use sealant produced by manufacturer who agrees to send a qualified technical representative to site upon request for the purpose of rendering advice concerning the recommended installation of manufacturer's materials.
- G. Sealants: Self leveling compounds for horizontal joints in pavements and nonsag compounds elsewhere except as shown or specified.
- H. Silicone Sealant: Comply with ASTM C920, Type M, Grade NS, Class 25; use NT, M, A and O.
 - 1. Use: Typical joints between masonry, metals, glass and plastics (Two part silicone sealants).
 - 2. Properties: Performance: Nonstain, nonbleed, nonstreaking to sealed and adjacent substrates. The minimum pli value after 7 day immersion shall not be less than 13 when tested in strict accordance with ASTM C794 Adhesion and Peel.
 - 3. Cure System and Oil Content: Neutral Cure System specifically manufactured with controlled oil content to eliminate oil migration into sealed substrates and residue rundown over and onto adjacent substrates.
 - 4. Product and Manufacturer: Dow Corning; 756 Silicone Building Sealant - HP with Additive.
- I. Silicone Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
 - 1. Use: Typical joints between masonry, metals, glass and plastics (Single component sealants).
 - 2. Properties: Performance: Nonstain, nonbleed, nonstreaking to sealed and adjacent substrates.
 - 3. Cure System and Oil Content: Neutral Cure System specifically manufactured with controlled oil content to eliminate oil migration into sealed substrates and residue rundown over and onto adjacent substrates.
 - 4. Product and Manufacturer:
 - a. BASF Building Systems; Omniseal 50.
 - b. Dow Corning Corporation; 756 SMS, 791, 795, 995 as applicable.
 - c. GE Advanced Materials, Silicones; SilGlaze II SCS2800, SilPruf NB SCS9000, SilPruf SCS2000, or UltraPruf II SCS2900 as applicable.
 - d. Pecora Corporation, as applicable.
 - e. Sika Corporation, Construction Products Division; SikaSil-C995.
 - f. Tremco, as applicable.
 - g. Comparable product.
- J. Two Part Polyurethane Sealants: ASTM C920, Type M, Grade NS, Class 50; use NT, M, A and O.
 - 1. Use: Typical Wall and Floor Joints (Two Part Polyurethane Sealants).
 - 2. Properties: Performance: Nonstain, nonbleed, nonstreaking to sealed and adjacent substrates. The minimum pli value after 7 day immersion shall not be less than 13 when tested in strict accordance with ASTM C794 Adhesion in Peel.
 - 3. Products and Manufacturers: One of the following:
 - a. BASF Construction Chemicals; NP 2.
 - b. Pecora Corporation, as applicable.

- c. Schnee-Morehead, Inc.; Permthane SM 7200.
 - d. Sika Corporation, Inc.; Sikaflex - 2c NS TG.
 - e. Tremco, as applicable.
 - f. Comparable product.
- K. Mildew Resistant Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT, Substrate uses G, A, and O; and containing fungicide for mildew resistance; acid curing.
1. Use: One-part mildew-resistant silicone, formulated with fungicide for sealing interior joints of nonporous substrates around ceramic tile, plumbing fixtures, showers.
 2. Products: Provide one of the following:
 - a. BASF Building Systems; Omniplus.
 - b. Dow Corning; 786 Mildew Resistant Silicone Sealant.
 - c. GE Silicones; Sanitary SCS 1700.
 - d. Pecora Corporation, as applicable.
 - e. Sika Corporation, Inc., as applicable.
 - f. Tremco, as applicable.
 - g. Comparable product.
- L. Latex Sealant: Nonelastomeric, one part, nonsag, paintable latex sealant that is recommended for exposed applications on the interior. Complying with ASTM C 834, Type OP (opaque sealants):
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF; Sonolastic Sonolac.
 - b. Pecora Corporation; AC-20 + Silicone.
 - c. Sika Corporation, Inc., as applicable.
 - d. Tremco, as applicable.
 - e. Comparable product.
- M. Acoustical Joint Sealant: Nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF, as applicable.
 - b. Pecora Corporation; AC-20 FTR or AIS-919.
 - c. Sika Corporation, Inc., as applicable.
 - d. Tremco, as applicable.
 - e. USG Corporation; SHEETROCK Acoustical Sealant.
 - f. Comparable product.
- N. Sealant Backing: Provide sealant backings that are nonstaining; compatible with joint substrates, sealants, primers, and joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
1. Cylindrical Sealant Backings: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding backings of flexible plastic foam complying with ASTM C 1330, and of type indicated below. Select shape and density of cylindrical sealant backings in consultation with the manufacturer for proper performance in specific condition of use in each case.
 2. Type C: Closed cell polyethylene foam material with surface skin, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state; one of the following:
 - a. BASF, as applicable.
 - b. HBR Closed Cell Backer Rod; Nomaco, Inc.
 - c. Pecora Corporation, as applicable.
 - d. Sonolastic Closed-Cell Backer-Rod; BASF Construction Chemicals.
 - e. Tremco, as applicable.
 - f. Comparable product.

- O. Miscellaneous Materials:
1. Primer: Material recommended, as verified through compatibility and adhesion testing, by joint sealant manufacturer for the substrates indicated to be sealed.
 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 joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.
 3. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and which will not stain nor mar the finish of surface adjacent to joints to which it is applied.
 4. Cork Joint Filler: Resilient and nonextruding, ASTM D1752, Type II.
 5. Bond Breaker Tape: Polyethylene, TFE fluorocarbon, or plastic tape 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants for compliance with requirements for joint configuration, installation tolerances, and conditions affecting sealant performance. Proceed with installation after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with the recommendations of joint sealant manufacturer and requirements:
1. Remove foreign material from joint substrates interfering with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), existing joint sealants, oil, grease, water, surface dirt, and frost.
 2. Clean concrete, masonry, unglazed surfaces of 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 joint 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 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 joint sealants.
- B. Joint Priming (Elastomeric Sealants Only): Prime joint substrates where recommended in writing by joint sealant manufacturer, based on prior testing and experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant 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. Silicone Glazing Sealants: Refer to Section 08 80 00 Glazing.

- B. Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- C. Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants applicable to materials, applications, and conditions indicated.
- D. Sealant Backings: Install sealant backings to support sealants during application and at position necessary to produce cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings. Trim for tight fit around obstructions or elements penetrating the joint.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that become wet before sealant application and replace with dry sealant backings.
 - 4. Install bond breaker tape behind sealants where backings are not used between sealants and back of joints.
- E. Weeps and Vents: Install weeps and vents into joints at the same time sealants are being installed. Locate weeps and vents spaced recommended by sealant manufacturer and the window and curtain wall fabricator and erector. Do not install weeps and vents at outside building corners. Do not install vents at horizontal joints immediately below shelf angles, sills, and through wall flashings.
- F. Sealants: Install sealants by proven techniques resulting 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 same time sealant backings are installed.
 - 1. Apply sealants in depth in accordance with manufacturer's recommendations and recommended general proportions and limitations.
 - 2. Apply elastomeric sealants, in joints not subject to traffic or abrasion, to a depth equal to 50% of the joint width, but not less than 1/4 inch (6 mm) and not more than 1/2 inch (13 mm).
 - 3. Apply nonelastomeric sealants to a depth approximately equal to the joint width.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform, beads 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. Tool exposed surfaces of sealants to the profile shown, or if none is shown, tool slightly concave.
 - 1. Use masking tape to protect adjacent surfaces of recessed tooled joints.
 - 2. Provide a slight wash on horizontal joints where horizontal and vertical surfaces meet.
 - 3. Against rough surfaces or in joints of uneven widths avoid the appearance of excess sealant or compound by locating the compound or sealant well back into joint wherever possible.
- H. Installation of Preformed Silicone Sealant System:
 - 1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 - 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch (10 mm). Hold edge of sealant bead 1/4 inch (6 mm) inside masking tape.
 - 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.

4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.
- I. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- J. Acoustical Sealant Installation: At sound rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer written recommendations.

3.4 FIELD QUALITY CONTROL

- A. Field Adhesion Testing: Field test exterior wall joint sealant adhesion to joint substrates:
 1. Extent of Testing: Test completed and cured sealant joints:
 - a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
 - b. Perform 1 test for each 1000 feet (300 m) of joint length thereafter or 1 test per each floor per elevation.
 2. Test Method: Test joint sealants according to Method A, Field Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer field adhesion hand pull test criteria.
 4. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure original sealant surfaces are clean and new sealant contacts original sealant.
- B. Evaluation of Field Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 SITE ENVIRONMENTAL PROCEDURES

- A. Indoor Air Quality: Provide temporary ventilation during work. Coordinate interior application of sealants with interior finishes schedule.

3.6 CLEANING AND PROTECTION

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- B. Protect joint sealants during and after curing from contact with contaminating substances and from damage so sealants are without deterioration or damage at time of Substantial Completion. If, despite protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 07 92 00

SECTION 08 11 13 HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Provide items shown on the Drawings and specified, including, but not limited to the following:
 - 1. Standard and fire rated steel doors.
 - 2. Steel frames for doors, sidelites, transoms, and windows.
 - 3. Louvers and vision lites in steel doors, if shown or required.
 - 4. Sound rated steel doors.
 - 5. Thermally rated steel doors.
- B. Related Sections:
 - 1. Section 05 40 00: Cold-Formed Metal Framing.
 - 2. Section 07 92 00: Joint Sealants.
 - 3. Section 08 80 00: Glazing.
 - 4. Section 09 21 16: Gypsum Board Assemblies.
 - 5. Section 09 23 00: Gypsum Plastering.
 - 6. Section 09 90 00: Painting and Coating.
- C. Reference Standards:
 - 1. ASTM International (ASTM)
 - a. A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - b. A924 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - c. A1008 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - d. A1011 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - e. C1363 Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
 - f. E283 Standard Test Method for Determining the rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - g. E413 Standard Classification for Rating Sound Insulation.
 - 2. Hollow Metal Manufacturers Association (HMMA):
 - a. HMMA 802 Manufacturing of Hollow Metal Doors and Frames.
 - b. HMMA 810 Hollow Metal Doors.
 - c. HMMA 830 Hardware Preparation and Locations for Hollow Metal Doors and Frames.
 - d. HMMA 840 Installation and Storage of Hollow Metal Doors and Frames.
 - e. HMMA 850 Fire Rated Hollow Metal Doors & Frames.
 - f. HMMA 890 Technical Summary of Hollow Metal by HMMA.
 - 3. National Fire Protection Association (NFPA):
 - a. 80 Fire Doors and Fire Windows.

- b. 252 Fire Tests of Door Assemblies.
- 4. Steel Door Institute – Current Standards: Technical Data Series.
- 5. Underwriters Laboratories Inc. (UL):
 - a. Building Materials Directory.
 - b. Listing and Labeling.
 - c. 10B and 10C Fire Tests of Door Assemblies.
 - d. 1784 Air Leakage Tests of Door Assemblies.
- 6. Intertek Testing, Services (Warnock Hersey, Inc. (WHI): Listing and Labeling.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's standard details and catalog data demonstrating compliance with specifications and referenced standards.
 - 2. Manufacturer's installation instructions.
- B. Shop Drawings:
 - 1. Indicate complete schedule in detail for each steel door and frame using the same reference number for details and openings as those on the contract Drawings. If any door is not by the steel door manufacturer, only the door opening number should be shown along with the type of door (wood, plastic laminate faced, etc.):
 - a. Show details of construction, installation, connections, anchors, hardware reinforcement, hardware preparation, louvers, and floor and threshold clearances.
- C. Samples are required from non-Steel Door Institute members:
 - 1. 12-inch by 12-inch sample of a fire-rated and non-rated door, cut from corner of door, showing door construction.
 - 2. 12-inch by 12-inch sample of each type of door louver specified or required, showing louver construction.
 - 3. Six-inch (6") long sample of a fire-rated, non-rated frame, and each type of glass stop specified or required, showing corner and construction.
- D. Certificates: Manufacturer's certification that oversized openings are in compliance with specifications.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: If other than a manufacturer listed under Paragraph 2.1 is proposed for use on the Project, it shall be a company specializing in the manufacturer of steel doors and frames of the type specified for this Project with a minimum of five (5) years' experience.
- B. All steel doors and frames shall be by a single manufacturer, shop drawings to be submitted with manufacturer's insignia, which is being supplied.
- C. Furnish steel doors and frames to meet current ANSI/Steel Door Standards.
- D. ANSI A250.13 Testing and Rating of Sever Windstorm Resistant Components for Swing Door Assemblies.

- E. ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- F. Comply with ASTM E283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- G. Regulatory Requirements:
 - 1. Fire-Rated Assemblies:
 - a. Fire-rated door, panel, frame, and fire window construction shall conform to NFPA 252, or UL 10B, as applicable, and acceptable to the code of authorities having jurisdiction.
 - b. Fire-rated door construction:
 - 1) Notwithstanding any other requirements of this Section, provide gauge of metal, method of construction, hardware preparation, reinforcement, and placement, glass opening size, and other specifics required to obtain the specified or required label. The label shall contain the fire resistance rating (20-minute, 45-minute, 1-hour, 1-1/2-hour, 3-hour, etc.) and the designation (A, B, C, D, or E); doors with B Label shall be 1-1/2 hour.
 - 2) Fire-rated doors used in a stairway enclosure, shall be so constructed so that the maximum transmitted temperature shall not exceed 450 degrees F above ambient temperature at the end of 30 minutes of the Standard Fire Exposure Test and shall be so noted on the label.
 - c. Fire-rated openings:
 - 1) Conform to NFPA 80 for fire-rated class shown or required by code of authorities having jurisdiction:
 - a) Units shall be identical to assemblies whose fire resistance characteristics have been determined in accordance with requirements specified above, and shall be labeled and listed by UL, WHI, or other inspection and testing agency acceptable to the code of authorities having jurisdiction.
 - b) Fire-rated steel doors, panels, frames, and fire windows shall bear permanent labels attesting to fire resistance. At stairway enclosures, provide units listed for 450 degree F maximum temperature rise rating for 30 minutes of exposure.
 - c) Oversized openings shall be constructed in accordance with all applicable requirements for labeled door construction.
 - d) Fire rated door assemblies with gaps in excess of 1/8 inch between door and frame will not comply with NFPA 80.
 - e) Locate label on hinge side of doors and frames so that when door is closed, label is not visible.
 - f) Caution shall be taken to ensure that labels are not removed, damaged, or painted over.
 - g) Glass panes shall not exceed sizes allowed whether indicated or not on the Drawings.
- H. Wind Loads: Provide hollow metal and door hardware assemblies approved by DSA, including anchorage, capable of withstanding wind load design pressures that are calculated for this Project by a registered Architect or Engineer and is part of the construction documents per CBC.
- I. Hurricane-Resistance Test Performance:
 - 1. Provide hollow metal and door hardware approved assemblies that pass large missile-impact tests, as required by authorities having jurisdiction:
 - a. Impact resistance: Hollow metal with approved door hardware assemblies must satisfy Division of the State Architect and CBC for protection from windborne

debris. The assemblies must have passed the large missile impact test, which equates to Missile Level D specified in ASTM E1996. The assemblies may be installed at any height on the structure as long as the design pressure rating for the assemblies is not exceeded. These assemblies will and do not need to be protected with an impact protective system when installed in areas where windborne debris protection is required.

- J. Accessibility Requirements:
 - 1. Comply with applicable requirements:
 - a. Americans with Disability Act of 1990, as amended: 2010 ADA Standards.
 - b. 2022 California Building Code (CBC). CCR Title 24, Part 2, as adopted and amended by DSA.
- K. Pre-Installation Conference: Refer to Section 01 31 00: Project Management and Coordination.

1.5 WARRANTY

- A. Warrant the work specified herein for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship.
- B. Defects shall include, but not be limited to:
 - 1. Use of incorrect materials in opening.
 - 2. Incorrect labeled components installed within opening.
 - 3. Noisy, rough, or difficult operation.
 - 4. Failure to meet specified quality assurance requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in accordance with manufacturer's instructions, and as follows:
 - 1. In manufacturer's original, clearly labeled, undamaged containers or wrappers.
 - 2. Containers or wrappers shall list the name of the manufacturer and product.
- B. Deliver materials to allow for minimum storage time at the Project site. Coordinate delivery with the scheduled time of installation.
- C. Protect products from moisture, construction traffic, and damage:
 - 1. Store under cover in a clean, dry place, protected from weather and abuse.
 - 2. Store in a manner that will prevent rust or damage.
 - 3. Store doors in a vertical position, spaced with blocking to permit air circulation.
 - 4. Do not use non-vented plastic or canvas shelters.
 - 5. Should containers or wrappers become wet, remove immediately.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers listed below whose products meet or exceed the specifications are approved for use on the Project. Other manufacturers must comply with Manufacturer Qualifications, must manufacture equivalent products to those specified, and comply with requirements of Section 01 25 00: Substitution Procedures and Form, regarding substitutions to be considered:
 - 1. CECO Door Products, Brentwood, TN; (615) 661-5030.
 - 2. Curries Company, Mason City, IA; (515) 423-1334.

3. Pioneer Industries, Inc., Kewanee, IL; (309) 856-6000.
4. Republic Builders Products Company, McKenzie, TN; (800) 733-3667.
5. Steelcraft Mfg. Co., Cincinnati, OH; (513) 745-6400.
6. Stiles Co.
7. Approved equal.

2.2 MATERIALS, GENERAL

- A. Steel requirements, all frames to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel per ASTM A1008 general requirements. Internal reinforcing may be manufactured of hot rolled pickled and oiled steel per ASTM A1011. Exterior frames and interior frames where shown on approved Drawings or required in damp, moist, humid, and wet areas, i.e., toilets, locker rooms, showers, etc., to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel and galvanized to A-60 minimum coating weight standard per ASTM A653 and A924, with coating weight of not less than 0.60 ounce per square foot (0.30 ounce per square foot per side).

2.3 FRAME FABRICATION

- A. Minimum Gauges:
 1. Interior openings:
 - a. Less than four feet (4') width: 16 gauge.
 - b. Four feet (4') in width and greater: 14 gauge.
 2. Exterior openings: 14 gauge
- B. Design and Construction:
 1. Frames shall be custom made, welded units with integral trim of sizes and shapes shown on approved shop drawings. Hinge jambs that butt adjacent 100-degree walls shall have at least four-inch (4") wide frame face to assure the door trim will not strike the wall prior to the door opening at least 100 degrees. Frame profile shall match wall thickness where practical, i.e., 4-3/4-inch at four-inch (4") CMU, 6-3/4-inch at six-inch (6") CMU, and 8-3/4-inch at eight-inch (8") CMU. At masonry wall openings, fabricate frames to suite masonry opening with two-inch (2") head member.
 2. Frames shall be strong and rigid, neat in appearance, square, true, and free of defects, warp, and buckle. Molded members shall be clean cut, straight, and of uniform profile throughout their length.
 3. Jamb depths, trim, profile, and backbends shall be as shown on approved shop drawings.
 4. Corner joints, including face and inside corners, shall have contact edges closed tight, with trim faces mitered and continuously welded, and stops butted. The use of gussets shall not be permitted. Face of frame shall be ground smooth. Knockdown (KD) frames are not permitted.
 5. Minimum depth of stops shall be 5/8 inch, except at fire windows where minimum depth of stops shall be 3/4 inch.
 6. Frames for multiple openings shall have mullion and rail members that are closed tubular shapes having no visible seams or joints. Joints between faces of abutting members shall be securely welded and finished smooth. Mullions shall be key locked removable type. Keys shall be master keyed to Owner's Best system.
 7. High frequency hinge reinforcement: Provide high frequency hinge reinforcements at door openings 48-inch and wider with mortise/butt type hinges only at top hinge location to deter against hinge reinforcement sag.
 8. Continuous hinge reinforcement: Provide welded continuous 12-gage strap for continuous hinges specified in hardware sets in Division 08 Openings.

9. Provide countersunk flat or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops; provide security head screws at exterior locations.
10. Provide A60 galvanized coating at frames in restrooms and locker rooms with showers/Jacuzzi, clean areas such as kitchen rooms.
11. Electrical knock out boxes:
 - a. Factory weld 18-gage electrical knock out boxes to frame for electrical hardware preps; included but not limited to electric thru wire hinges, electrical raceways, door position switches, electric strikes, jamb mount card readers, and magnetic locks as noted in door hardware sets in Division 08 Openings:
 - 1) Electrical knock out boxes are required at door position switches, electric strikes, card readers, and middle hinge locations.
 - 2) Provide electrical knock out boxes with 3/4-inch knockouts.
 - 3) Conduit to be coordinated and installed in field from middle hinge box and strike box to door position box.
 - 4) Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Openings.
 - 5) Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
 - 6) Provide field installed conduit per Division 28: Electronic Safety & Security Section for standardized plug connectors to accommodate up to twelve (12) wires as required for electrified door hardware specified in hardware sets in Division 08 Openings. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Wire nut connections are not acceptable.
12. Hardware reinforcements:
 - a. Frames shall be mortised, reinforced, drilled, and tapped at factory for fully template mortised hardware in accordance with approved hardware schedule and templates provided by Section 08 71 00: Door Hardware. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates only.
 - b. Minimum thickness of hardware reinforcing plates shall be as follows:
 - 1) Hinge and pivot reinforcements (1-1/4-inch x 10-inch minimum size): Seven (7) gauge.
 - 2) Strike reinforcements: 12-gauge stiffeners.
 - 3) Flush bolt reinforcements: 12-gauge.
 - 4) Closer reinforcements: 12-gauge.
 - 5) Reinforcements for surface-mounted hardware, hold-open arms, and surface panic devices: 12-gauge.
13. Floor anchors: Minimum 14-gauge, securely welded inside each jamb, with holes for floor anchorage.
14. Jamb anchors:
 - a. Frames for installation in masonry walls shall be provided with adjustable jamb anchors of the T-strap type. Anchors shall be not less than 16-gauge steel. The number of anchors provided at each jamb shall be as follows:
 - 1) Frames up to seven-feet-six-inches (7'-6") in height: Three (3) anchors.
 - 2) Frames seven-feet-six-inches (7'-6") to eight feet (8') in height: Four (4) anchors.
 - 3) Frames over eight feet (8') in height: One (1) anchor for each two feet (2') or fraction thereof in height.
 - b. Frames for installation in wood or metal stud partitions shall be provided with steel anchors of suitable approved design, not less than 16-gauge thickness, securely welded inside each jamb as follows:
 - 1) Frames up to seven feet six inches (7'-6") in height: Four (4) anchors.
 - 2) Frames seven feet six inches (7'-6") to eight feet (8') in height: Five (5) anchors.

- 3) Frames over eight feet (8') in height: Four (4) anchors plus one (1) additional for each two feet (2') or fraction thereof over eight feet (8').
 - c. Frames to be anchored to previously placed concrete, masonry, or structural steel shall be provided with anchors of suitable design as shown on approved shop drawings.
 15. Dust cover boxes: Shall be of not less than 26-gauge steel and shall be provided at all mortised hardware items. Eight-inch (8") CMU walls with face brick shall have dual offset jamb anchors.
 16. Steel spreader: Shall be provided on all frames, temporarily attached to bottoms of both jambs for bracing during shipping and handling.
 17. Loose glazing stops: Shall be of cold rolled steel, not less than 20 gauge, butted at corner joints and secured to the frame with countersunk cadmium or zinc-plated screws. Loose stops at exterior frames shall be placed on the interior side of the frames.
 18. Unless otherwise noted on Drawings, ALL doors coat inside of frame profile with corrosion resistant coating to minimum thickness of 1/16 inch.
- C. Frame Color: Field painted under Section 09 90 00: Painting and Coating to match face of door unless otherwise indicated on drawings.

2.4 DOOR FABRICATION

- A. Minimum Gauges
1. Interior doors: 0.047 inch or 18 gauge (16 gauge for high frequency doors). Exterior doors: 0.059 inch or 16 gauge (14 gauge for windstorm rated doors). Design and Construction:
 2. Types: Doors shall be custom fabricated, of types and sizes shown on approved shop drawings, and shall be seamless face construction with no visible seams or joints on vertical edges with fully welded seams free from blemishes and defects. Thickness shall be 1-3/4 inch, unless specifically noted or shown otherwise. Exterior doors: Provide doors with 22-gage steel z-channels placed at six inches (6") apart with foamed in place polyurethane core, with a thermal insulation calculated R factor of 11.01 per ASTM C518 Standards.
 3. Fabrication:
 - a. Doors shall be strong, rigid, and neat in appearance, free from warpage and buckle.
 - b. Corner bends shall be true and straight and of minimum radius for gage of metal used.
 - c. Provide stiffeners with polystyrene core spaced maximum six inches (6") on center and extending full height of door.
 - d. Fill interior with noncombustible fiberglass insulation. Use mineral board filler as required for labeled doors.
 - e. Faces shall be joined at vertical edges of door by a continuous weld extending full height of door. Welds shall be ground, filled, and dressed smooth to provide a smooth flush surface.
 - f. Top and bottom edges of doors shall be closed with a continuous recessed steel channel not less than 16 gauge, extending full width of door and spot weld to both faces. Exterior doors shall have an additional flush closing channel at top and bottom edges. Openings shall be provided in the bottom closure channel at top and bottom edges. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.
 - g. Continuous hinge reinforcement: Provide welded continuous 12-gage strap for continuous hinges specified in hardware sets in Division 08: Openings.

- h. Electrical raceways: Provide raceways for standardized plug connectors to accommodate up to 12 wires as required for electrified door hardware specified in hardware sets in Division 08: Openings. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Wire nut connections are not acceptable.
- i. Doors in wet or humid areas shall have a top cap and solid foam interior core to prevent internal moisture accumulation and galvannealed.
- j. Edge profile shall be provided on both vertical edges of door as follows:
 - 1) Single-acting swing doors: Beveled 1/8 inch in two inches (2").
- k. Hardware reinforcements:
 - 1) Doors shall be mortised, reinforced, drilled, and tapped at factory for fully template hardware, in accordance with the approved hardware schedule and templates provided by Section 08 71 00: Door Hardware. Where surface-mounted hardware is to be applied, doors shall have reinforcing plates only.
 - 2) Minimum gauges for hardware reinforcing plates shall be as follows:
 - a) Hinge and pivot reinforcements: Seven (7) gauge.
 - b) Reinforcements for lock face, flush bolts, concealed holders, concealed or surface-mounted closers: 12 gauge.
- 4. Glass moldings and stops: Loose stops shall be not less than 20-gauge steel, with butt corner joints, secured to frame opening by countersunk screws. Snap-on attachments will not be acceptable.
- 5. Louvers: Shall be inverted "V" blade, sight-proof type, unless noted otherwise.
- 6. Edge clearances:
 - a. Between door and frame at head and jambs: 1/8 inch.
 - b. At doorsills with no threshold: 5/8-inch to 3/4-inch above finished floor.
 - c. At doorsills with threshold: As required to suit threshold.
 - d. Between meeting edges of double doors: 1/8 inch.
- B. Finish:
 - 1. Shop paint steel (whether galvanized or ungalvanized) stops and accessories as follows:
 - a. Clean surfaces free of mill scale, rust, oil, grease, dirt, and other foreign matter.
 - b. Chemically treat surfaces and apply one (1) coat of an approved baked-on rust-inhibitive primer paint to provide a minimum 0.5 mil dry film thickness.
 - 2. Field painted under Section 09 90 00: Painting and Coating.
- C. Sound Rated Door: STC of 32, measured in accordance with ASTM E413.
- D. Thermal Insulated Door: Total insulation R-Value of 44 measured in accordance with ASTM C1363, unless otherwise noted on Drawings.

2.5 LABELED DOORS AND FRAMES

- A. Labeled doors and frames shall be provided for openings requiring fire protection ratings as scheduled and to comply with NFPA 80. Such doors and frames shall be constructed as tested and approved by UL, WHI, or other nationally recognized testing agency having a factory inspection service and approved by code authorities having jurisdiction and shall bear the appropriate permanent label.
- B. If any door or frame scheduled to be fire-rated cannot qualify for appropriate labeling because of its size, design, hardware, or other reason, the Architect shall be so advised before fabrication work on that item is started. Indicate and highlight on shop drawing.

PART 3 EXECUTION

3.1 COORDINATION

- A. Coordinate the work of this Section.
- B. Coordinate hardware installation with opening construction. Finish hardware is specified in Section 08 71 00: Door Hardware.
- C. Coordinate doors, frames, and windows with glazing specified in Section 08 80 00: Glazing.
- D. Coordinate doors and frames with painting specified in Section 09 90 00: Painting and Coating.

3.2 INSTALLATION

- A. Separate dissimilar metals. Protect against galvanic action.
- B. Frames:
 - 1. Anchorage and connections: Secure to adjacent construction. Where practical, interior door frames shall be flush with the pull side wall to minimize or eliminate the reveal and allow full 180-degree door swing.
 - 2. Install frames in accordance with manufacturer's instructions and install labeled frames in accordance with NFPA 80.
 - 3. Frame spreader bars: Leave intact until frames are set perfectly square and plumb and anchors are securely attached.
 - 4. Remove hardware, with the exception of prime-coated items, tag box, and reinstall after finish paint work is completed. Do not remove or paint over labels on labeled frames.
- C. Doors:
 - 1. Install hardware in accordance with hardware manufacturer's templates and instructions.
 - 2. Install doors in accordance with manufacturer's instructions and install labeled doors in accordance with NFPA 80.
 - 3. Adjust operable parts for correct function.
 - 4. Remove hardware, with the exception of prime-coated items, tag, box, and reinstall after finish paint Work is completed. Do not remove or paint over labels on labeled doors.

3.3 ADJUST AND CLEAN

- A. Adjust doors for proper operation, free from binding or other defects.
- B. Clean and restore soiled surfaces.
- C. Remove scraps and debris, and leave site in clean condition.

END OF SECTION 08 11 13

SECTION 08 71 00 – DOOR HARDWARE

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. Mechanical and electrified door hardware for:
 - a. Swinging doors.
- 2. Field verification, preparation and modification of existing doors and frames to receive new door hardware.

- B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

- 1. Windows
- 2. Cabinets (casework), including locks in cabinets
- 3. Signage
- 4. Toilet accessories
- 5. Overhead doors

- C. Related Sections:

- 1. Division 01 Section "Alternates" for alternates affecting this section.
- 2. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
- 3. Division 09 sections for touchup finishing or refinishing of existing openings modified by this section.
- 4. Division 26 sections for connections to electrical power system and for low-voltage wiring.
- 5. Division 28 sections for coordination with other components of electronic access control system.

1.3 REFERENCES

- A. UL - Underwriters Laboratories

- 1. UL 10B - Fire Test of Door Assemblies
- 2. UL 10C - Positive Pressure Test of Fire Door Assemblies
- 3. UL 1784 - Air Leakage Tests of Door Assemblies
- 4. UL 305 - Panic Hardware

- B. ANSI - American National Standards Institute
 - 1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
- C. California Code of Regulations
 - 1. Title 24: California Building Standards Code

1.4 SUBMITTALS

- A. General:
 - 1. Submit in accordance with Conditions of Contract and Division 01 requirements.
 - 2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
 - 3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.
- B. Action Submittals:
 - 1. Product Data: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
 - 2. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.
 - a. Samples will be returned to supplier in like-new condition. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
 - 3. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:
 - a. Door Index; include door number, heading number, and Architects hardware set number.
 - b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
 - c. Type, style, function, size, and finish of each hardware item.
 - d. Name and manufacturer of each item.
 - e. Fastenings and other pertinent information.
 - f. Location of each hardware set cross-referenced to indications on Drawings.
 - g. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - h. Mounting locations for hardware.
 - i. Door and frame sizes and materials.
 - j. Name and phone number for local manufacturer's representative for each product.

- k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components).
Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.
 - 1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.
 4. Key Schedule:
 - a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
 - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
 - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
 - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
 - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
 - 1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
 - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
 5. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.
- C. Informational Submittals:
1. Qualification Data: For Supplier and Installer.
 2. Product Certificates for electrified door hardware, signed by manufacturer:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
 3. Certificates of Compliance:
 - a. Certificates of compliance for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
 - b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in "QUALITY ASSURANCE" article, herein.
 - c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.
 4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.
 5. Warranty: Special warranty specified in this Section.

D. Closeout Submittals:

1. Operations and Maintenance Data : Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Name, address, and phone number of local representative for each manufacturer.
 - d. Parts list for each product.
 - e. Final approved hardware schedule, edited to reflect conditions as-installed.
 - f. Final keying schedule
 - g. Copies of floor plans with keying nomenclature
 - h. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
 - i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.5 QUALITY ASSURANCE

- A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.
 1. Where specific manufacturer's product is named and accompanied by "No Substitute," including make or model number or other designation, provide product specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)
 - a. Where no additional products or manufacturers are listed in product category, requirements for "No Substitute" govern product selection.
 2. Where products indicate "acceptable manufacturers" or "acceptable manufacturers and products", provide product from specified manufacturers, subject to compliance with specified requirements and "Single Source Responsibility" requirements stated herein.
- B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project.
 1. Warehousing Facilities: In Project's vicinity.
 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
 4. Coordination Responsibility: Coordinate installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
 - a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.
- C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.

- D. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
 2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- E. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
- F. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
- G. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
- H. Means of Egress Doors: Latches do not require more than 5 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.
- I. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbf (22.2 N).
 2. Maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 3. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 4. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.
- J. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01.
1. Attendees: Owner, Contractor, Architect, Installer, Owner's Security Consultant, and Supplier.
 2. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
 - a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.

- d. Requirements for access control.
 - e. Address for delivery of keys.
- K. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01.
- 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Inspect and discuss preparatory work performed by other trades.
 - 3. Inspect and discuss electrical roughing-in for electrified door hardware.
 - 4. Review sequence of operation for each type of electrified door hardware.
 - 5. Review required testing, inspecting, and certifying procedures.
- L. Coordination Conferences:
- 1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.
 - a. Attendees: Door hardware supplier, door hardware installer, Contractor.
 - b. After meeting, provide letter of compliance to Architect, indicating when meeting was held and who was in attendance.
 - 2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.
 - a. Attendees: electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, Owner, Owner's security consultant, Architect and Contractor.
 - b. After meeting, provide letter of compliance to Architect, indicating when coordination conference was held and who was in attendance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
 - 1. Deliver each article of hardware in manufacturer's original packaging.
- C. Project Conditions:
 - 1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
 - 2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Protection and Damage:
 - 1. Promptly replace products damaged during shipping.
 - 2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.

3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- F. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.7 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.
- F. Direct shipments not permitted, unless approved by Contractor.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Years from date of Substantial Completion, for durations indicated.
 - a. Closers:
Mechanical: 30 years **for LCN 4000**
 - b. Exit Devices:
 - 1) Mechanical: 3 years.
 - c. Locksets:
Mechanical: 3 years.
 - d. Continuous Hinges: Lifetime warranty
 - e. Key Blanks: Lifetime
 2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.9 REGULATORY REQUIREMENTS: CBC 2022)

- A. Locate latching hardware between 34 inches to 44 inches above the finished floor, per 2022 California Building Code, Section 11B-404.2.7.
 - 1. Panic hardware: locate between 36 inches to 44 inches above the finished floor.
- B. Handles, pull, latches, locks, other operable parts:
 - 1. Readily openable from egress side with one hand and without tight grasping, tight pinching, or twisting of the wrist to operate. 2022 California Building Code Section 11B-309.4.
 - 2. Force required to activate the operable parts: 5.0 pounds maximum, per 2022 California Building Code Section 11B-309.4.
- C. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2022 California Building Code Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.
 - 1. Exception: exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leafs or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.
- D. Low-energy powered doors: comply with ANSI/BHMA A156.19. Reference: 2022 California Building Code Section 11B-404.2.9, Exception 2.
 - 1. Where powered door serves an occupancy of 150 or more, provide back-up battery power or stand-by generator power, capable of supporting a minimum of 100 cycles.
 - 2. Actuators, vertical bar type: minimum 2-inches wide, 30-inches high, bottom located minimum 5-inches above floor or ground, top located minimum 35-inches above floor or ground. Displays International Symbol of Accessibility, per 2022 California Building Code Section 11B-703.7.
 - 3. Actuators, plate type: use two at each side of the opening. Minimum 4-inches diameter or 4-inches square. Displays International Symbol of Accessibility, per 2022 California Building Code Section 11B-703.7. Locate centerline of lower plate between 7- and 8-inches above floor or ground, and upper plate between 30- and 44-inches above floor or ground.
 - 4. Actuator location: conspicuously located, clear and level floor/ground space for forward or parallel approach.
- E. Adjust door closer sweep periods so that from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch, measured to the landing side of the door, per 2022 California Building Code Section 11B-404.2.8.
 - 1. Spring hinges: adjust for 1.5 seconds minimum for 70 degrees to fully-closed.
- F. Smooth surfaces at bottom 10 inches of push sides of doors, facilitating push-open with wheelchair footrests, per 2022 California Building Code Section 11B-404.2.10.
 - 1. Applied kickplates and armor plates: bevel the left and right edges; free of sharp or abrasive edges.
 - 2. Tempered glass doors without stiles: bottom rail may be less than 10 inches if top leading edge is tapered 60 degrees minimum.

- G. Door opening clear width no less than 32 inches, measured from face of frame stop, or edge of inactive leaf of pair of doors, to door face with door opened to 90 degrees. Hardware projection not a factor in clear width if located above 30 inches and below 80 inches, and the hardware projects no more than 4 inches. 2022 California Building Code Section 11B-404.2.3.
 - 1. Exception: In alterations, a projection of 5/8 inch (15.9 mm) maximum into the required clear width shall be permitted for the latch side stop.
 - 2. Door closers and overhead stops: not less than 78 inches above the finished floor or ground, per 2022 California Building Code 11B-307.4.
- H. Thresholds: floor or landing no more than 0.50 inches below the top of the threshold of the doorway, per 2022 California Building Code Section 11B-404.2.5. Vertical rise no more than 0.25 inches, change in level between 0.25 inches and 0.50 inches: beveled to slope no greater than 1:2 (50 percent slope). 2022 California Building Code Section 11B-303.2 & ~.3.
- I. Floor stops: Do not locate in path of travel. Locate no more than 4 inches from walls, per DSA Policy #99-08 (Access).
- J. Pairs of doors with independently-activated hardware both leafs: limit swing of right-hand or right-hand-reverse leaf to 90 degrees to protect persons reading wall-mounted tactile signage, per 2022 California Building Code Section 11B-703.4.2.
- K. Door and door hardware encroachment: when door is swung fully-open into means-of-egress path, the doo may not encroach/project more than 7 inches into the required exit width, with the exception of door release hardware such as lockset levers or panic hardware. These hardware items must be located no less than 34-inches and no more than 44-inches above the floor/ground. 2022 California Building Code, Section 1005.7.1.
- L. In I-2 occupancies, latch release hardware is not permitted to project in the required exit width, regardless of its mounting height, per 2022 California Building Code, Section 1005.7.1 at Exception 1.

1.10 MAINTENANCE

A. Maintenance Tools:

- 1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- 2.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturer" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

- D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- E. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.2 MATERIALS

A. Fasteners

- 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
- 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
- 3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
- 4. Install hardware with fasteners provided by hardware manufacturer.

B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.

- 1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
- 2. Use materials which match materials of adjacent modified areas.
- 3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

- 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.3 HINGES

A. Manufacturers and Products:

- 1. Scheduled Manufacturer and Product: Ives 5BB series
- 2. Acceptable Manufacturers and Products: No Substitute.

B. Requirements:

- 1. Provide five-knuckle ball bearing hinges conforming to ANSI/BHMA A156.1.
- 2. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
 - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
 - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

3. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
 - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
 - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
4. 2 inches or thicker doors:
 - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
 - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
5. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
6. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins
 - c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins
8. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
9. Doors 36 inches (914 mm) wide or less furnish hinges 4-1/2 inches (114 mm) high; doors greater than 36 inches (914 mm) wide furnish hinges 5 inches (127 mm) high, heavy weight or standard weight as specified.
10. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
11. Provide mortar guard for each electrified hinge specified.
12. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.

2.4 CONTINUOUS HINGES

A. Aluminum Geared

1. Manufacturers:
 - a. Scheduled Manufacturer: Ives.
 - b. Acceptable Manufacturers and Products: No Substitute.
2. Requirements:
 - a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
 - b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with 0.25-inch (6 mm) diameter Teflon coated stainless steel hinge pin.
 - c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.

- d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
- e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
- f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
- g. Install hinges with fasteners supplied by manufacturer.
- h. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.5 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage L9000 series
2. Acceptable Manufacturers and Products: No Substitute.

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
2. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
3. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
4. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide a request to exit (RX) switch that is actuated with rotation of inside lever.
5. Provide motor based electrified locksets with electrified options as scheduled in the hardware sets and comply with the following requirements:
 - a. Universal input voltage – single chassis accepts 12 or 24V DC to allow for changes in the field without changing lock chassis.
 - b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case
 - c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
 - d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate "hot levers" in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
 - e. Request to Exit Switch (RX) –
 - 1) Modular Design – provide electrified locks capable of using, adding, or changing a modular RX switch without opening the lock case.
 - 2) Monitoring – where scheduled, provide a request to exit (RX) switch that detects rotation of the inside lever.
 - f. Connections – provide quick-connect Molex system standard.
 - g. UL Listed – 3 hour fire door

6. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
 - a. Lever Design: Schlage **06A**.
 - b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.6 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 98 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit or Fire Exit Hardware. Cylinders: Refer to "KEYING" article, herein.
2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
3. Touchpad: Extend minimum of one half of door width. Match exit device finish, stainless steel for US26, US26D, US28, US32, and US32D finishes; and for all other finishes, provide compatible finish to exit device. No plastic inserts are allowed in touchpads.
4. Provide exit devices with dead-latching feature for security and for future addition of alarm kits and/or other electrified requirements.
5. Provide flush end caps for exit devices.
6. Provide exit devices with manufacturer's approved strikes.
7. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
8. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
9. Provide cylinder dogging at non-fire-rated exit devices.
10. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
11. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
 - a. Lever Style: Match lever style of locksets.
 - b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.
12. Provide UL labeled fire exit hardware for fire rated openings.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.

2.7 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer: Schlage Primus

B. Requirements:

1. Provide Schlage Primus keying system - cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Replaceable Construction Cores.
 - a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
 - 1) 3 construction control keys
 - 2) 12 construction change (day) keys.
 - b. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.8 KEYING

- A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- B. Provide cylinders/cores keyed into Owner's existing factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
 1. Firm Name:
 2. Contact Person:
 3. Telephone:
- C. Requirements:
 1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
 - a. Master Keying system as directed by the Owner.
 2. Forward biting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements shall be cause for replacement of cylinders/cores involved at no additional cost to Owner.
 3. Provide keys with the following features:
 - a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
 - b. Patent Protection: Keys and blanks protected by one or more utility patent(s)
 - c. Geographically Exclusive: Where High Security or Security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions.

- 1) One allocation within postal zip codes with the same first 2 digits.
 - 2) One allocation per time zone.
 - 3) One allocation per Country.
4. Identification:
- a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Blind code marks shall not include actual key cuts.
 - b. Identification stamping provisions must be approved by the Architect and Owner.
 - c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
 - d. Failure to comply with stamping requirements shall be cause for replacement of keys involved at no additional cost to Owner.
 - e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
5. Quantity: Furnish in the following quantities.
- a. Change (Day) Keys: 3 per cylinder/core.
 - b. Permanent Control Keys: 3.
 - c. Master Keys: 6.

2.9 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer: Telkee
2. Acceptable Manufacturers: HPC, Lund

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
 - a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
 - b. Provide hinged-panel type cabinet for wall mounting.

2.10 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4040XP series.
2. Acceptable Manufacturers and Products: No Substitute.

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.

2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 3/4 inch (19 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
11. Door closers and gate closing speed shall comply with section 11B-404.2.8. Door closers and gate closers shall be adjusted so that from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 second minimum.
12. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2022 California Building Code Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.

2.11 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Rockwood, Trimco

B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

2.12 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Rockwood, Trimco

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:
 - a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
 - b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
 - c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.13 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson
2. Acceptable Manufacturers: Rixson, Sargent

B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.14 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Rockwood, Trimco

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.

2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.15 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer: Zero International
2. Acceptable Manufacturers: National Guard, Pemko

B. Requirements:

1. Provide thresholds, weather-stripping (including door sweeps, seals, and astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Size of thresholds:
 - a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
 - b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.16 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Rockwood, Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.17 FINISHES

A. Finish: BHMA 626/652 (US26D); except:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Continuous Hinges: BHMA 630 (US32D)
3. Continuous Hinges: BHMA 628 (US28)
4. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
5. Protection Plates: BHMA 630 (US32D)
6. Overhead Stops and Holders: BHMA 630 (US32D)
7. Door Closers: Powder Coat to Match
8. Wall Stops: BHMA 630 (US32D)
9. Latch Protectors: BHMA 630 (US32D)

10. Weatherstripping: Clear Anodized Aluminum
11. Thresholds: Mill Finish Aluminum

2.18 SPECIAL FINISHES

A. Antimicrobial coatings

1. Furnish with antimicrobial coated hardware items designed with AM suffix to the finish, 626AM and /or 630AM. The non-toxic coating to be natural inorganic silver-ion based antimicrobial added to the clear coating. The powder coat containing the antimicrobial compound to be electro-statically applied to a minimum thickness of 1.5 mils. The antimicrobial coatings are to protect the surface of the hardware item by inhibiting the growth of bacteria, mold, mildew, and odor. The antimicrobial coating shall pass the BHMA clear coat requirements and be registered with the EPA and FDA listed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
- C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Where on-site modification of doors and frames is required:
 1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
 2. Field modify and prepare existing door and frame for new hardware being installed.
 3. When modifications are exposed to view, use concealed fasteners, when possible.
 4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
 - a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
 - b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
 - c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- H. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying section.
- I. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- J. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.
- K. Closer/holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- L. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- M. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- N. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- O. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

- P. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION



- A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.7 DOOR HARDWARE SCHEDULE

- A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.
- B. Hardware Sets:

87088 OPT0313022 Version 3

Legend:













-  Link to catalog cut sheet
-  Electrified Opening

Hardware Group No. 001

For use on Door #(s):

G103 G105 G112

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY		628	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-98-NL-OP-110MD		630	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	MORTISE CYLINDER	20-061 36-083		626	SCH
2	EA	PRIMUS CORE	20-740		626	SCH
1	EA	DOOR PULL	VR910 NL		630	IVE
2	EA	SURFACE CLOSER	4040XP TORX TOP JAMB MOUNTING		689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP/HOLDER	FS40/41/42/43		626	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	103A OR AS DETAILED		A	ZER

TOP JAMB MOUNTING

180 DEGREE SWING













EXISTING FRAME TO REMAIN AND REUSE - FIELD VERIFY EXISTING CONDITION

NEW HINGE TO PREFIT EXISTING FRAME HARDWARE PREP - FIELD VERIFY EXISTING CONDITION

~~Hardware Group No. 002~~

~~For use on Door #(s):
G110~~

~~Provide each SGL door(s) with the following:~~

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112XY		628	IVE
4	EA	PANIC HARDWARE	GDSI-PA-AX-98-NL-OP-110MD		630	VON
4	EA	RIM CYLINDER	20-057		626	SCH
4	EA	MORTISE CYLINDER	20-061-36-083		626	SCH
2	EA	PRIMUS CORE	20-740		626	SCH
4	EA	DOOR PULL	VR910-NL		630	IVE
2	EA	SURFACE CLOSER	4040XP TORX TOP JAMB MOUNTING		689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
4	EA	FLOOR STOP/HOLDER	FS40/41/42/43		626	IVE
4	EA	GASKETING	188SBK-PSA		BK	ZER
4	EA	DOOR SWEEP	39A		A	ZER
4	EA	THRESHOLD	103A OR AS DETAILED		A	ZER

~~TOP JAMB MOUNTING
180 DEGREE SWING~~

Hardware Group No. 002R

For use on Door #(s):
G107 G110

Provide each SGL door(s) with the following:










QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
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EXISTING DOOR, FRAME AND FINISH HARDWARE TO REMAIN AND REUSE

Hardware Group No. 003

For use on Door #(s):
G108 G109

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112XY		628	IVE
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	PRIMUS CORE	20-740		626	SCH
2	EA	OH STOP	100S		630	GLY
2	EA	SURFACE CLOSER	4040XP TORX TOP JAMB MOUNTING		689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	188SBK-PSA		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	103A OR AS DETAILED		A	ZER










TOP JAMB MOUNTING
WEATHER SEAL BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 004

For use on Door #(s):

G104 G106 G111

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY		628	IVE
1	EA	CLASSROOM SECURITY	L9071T 06A		626	SCH
2	EA	PRIMUS CORE	20-740		626	SCH
2	EA	SURFACE CLOSER	4040XP TORX TOP JAMB MOUNTING		689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP/HOLDER	FS40/41/42/43		626	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	103A OR AS DETAILED		A	ZER

TOP JAMB MOUNTING

180 DEGREE SWING

EXISTING FRAME TO REMAIN AND REUSE - FIELD VERIFY EXISTING CONDITION

NEW HINGE TO PREFIT EXISTING FRAME HARDWARE PREP - FIELD VERIFY EXISTING
CONDITION

END OF SECTION

SECTION 08 80 00 GLAZING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 1. Tempered glass.
 2. Insulated glass.
 3. Spandrel glazing.
 4. Accessories necessary for a complete installation.

1.3 DEFINITIONS

- A. Glass Thickness: Indicated by thickness designations in millimeters according to ASTM C1036.
- B. Interspace: Space between lites of an insulating glass unit.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design glass panels including comprehensive engineering analysis by a qualified professional engineer lawfully licensed in the State of California, using performance requirements and design criteria indicated.
- B. Installed Glazing: Design glazing systems to withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- C. Glazing shall withstand the following design loads within limits and under conditions indicated determined according to ASTM E1300:
 1. Design Wind Pressures: Indicated on Drawings.
 2. Design Wind Pressures:
 - a. Determine design wind pressures applicable to Project according to ASCE 7, based on heights above grade indicated on Drawings:
 - 1) Wind Design Data: As indicated on Drawings.
 - 2) Basic Wind Speed: 110 mph (49 m/s).
 - 3) Importance Factor: 1.25 for schools.
 3. Exposure Category: C.
 4. Design Snow Loads: Indicated on Drawings.
 5. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
 6. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
 7. Maximum Lateral Deflection: For glass supported on all four edges, limit center of glass deflection at design wind pressure to not more than 1/50 times the short side length or 1 inch (25 mm), whichever is less.

- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties:
 - 1. Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 - a. For monolithic glass lites, properties are based on units with lites 6 mm thick.
 - b. For laminated glass lites, properties are based on products of construction indicated.
 - c. For insulating glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 - d. U-Factors: Center of glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 - e. Solar Heat Gain Coefficient and Visible Transmittance: Center of glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 - f. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

1.5 SUBMITTALS

- A. Product Data: Technical data for each type of product including recommended installation and cleaning procedures.
- B. Glass Samples: For each type of glass required. Prepare samples from same material to be used for Work.
- C. Glazing Schedule: List glass types and thickness for each size opening and location. Use same designations indicated on Drawings.
- D. Delegated Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Product Certificates: Submit glass product certificates required by Code.
- F. Glass Manufacturer Certificate: The glass manufacturer shall submit a letter certifying it has reviewed the glazing details proposed for the project, including the use of gaskets and sealants, and that each product furnished is recommended for the application shown and compliance with the Code.
- G. Thermal Stress and Wind Load Analyses:
 - 1. Submit the following from the glass manufacturer:
 - a. Thermal stress analysis for each exterior glass unit type, each building elevation. The analysis shall clearly indicate the expected service temperature ranges and the effects of partial and full shading on the glass:
 - 1) Attach to the thermal stress analysis a statement from the glass manufacturer that based upon this analysis that the resulting thermal stresses will not reduce the specified statistical probability of breakage.
 - b. Wind load analysis for each glass unit type, each building elevation. The analysis shall indicate the statistical probability of breakage at the design wind pressure does not exceed the specified statistical probability of breakage.

- H. Product Test Reports:
1. Submit test reports for insulating glass and glazing sealants, for tests performed by a qualified testing agency:
 - a. Glazing Sealants: Provide test reports based on testing current sealant formulations within previous 36 month period.
 - b. Glazing Sealants: Preconstruction adhesion and compatibility test report.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. Building Code: Comply with applicable requirements for glazing in CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA).
 2. Energy Code: Comply with applicable requirements of glazing in the 2013 California Green Building Standards Code California Code of Regulations, Title 24, Part 11.
 3. Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies:
 - a. As a minimum provide Category II materials complying with testing requirements in 16 CFR 1201 (Consumer Product Safety Commission *Safety Standard for Architectural Glazing Materials*, published in the Code of Federal Regulations) and ANSI Z97.1.
 - b. Permanently mark safety glass with certification label of Safety Glazing Certification Council.
 4. All safety glass shall pass the test requirements of CPSC 16 CFR 1201 criteria, for Category I or II as indicated in Table 2406.2(1), CBC and below:
 - a. 9 sq. ft. or less: Category I.
 - b. More than 9 sq. ft., sliding doors and shower glazing: Category I.
 5. Insulating Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
 6. Comply with published recommendations of glass product organizations:
 - a. GANA: Glazing Manual.
 - b. IGMA: SIGMA TM-3000 Vertical Glazing Guidelines.
 - c. GANA: Laminated Glazing Reference Manual.
 - d. AAMA: AAMA GDSG-1 Glass Design for Sloped Glazing.
 - e. AAMA: TIR A7 Sloped Glazing Guidelines.
 - f. IGMA for Sloped Glazing: IGMA TB-3001 Guidelines for Sloped Glazing.
 - g. IGMA for Insulating Glass: SIGMA TM-3000 North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use.
 7. Where annealed float glass is indicated, provide annealed float glass, heat strengthened float glass, or fully tempered float glass necessary to comply with performance requirements:
 - a. Where heat strengthened float glass is indicated, provide heat strengthened float glass or fully tempered float glass necessary to comply with performance requirements.
 - b. Where fully tempered float glass is indicated, provide fully tempered float glass.
- B. Manufacturer Qualifications for Insulating Glass Units with Sputter Coated, Low E Coatings: Insulating glass manufacturer who is approved and certified by coated glass manufacturer.
- C. Installer Qualifications, Glazer: Experience entity having minimum 5 years documented experience and who employs glass installers certified under the National Glass Association's Certified Glass Installer Program.
- D. Installer Qualifications, Decorative Film: Experience entity having minimum 5 years documented experience in the installation of glass films.

- E. Source Limitations for Glass and Glass Accessories: Obtain each type of glass and glass accessories from a single source.
- F. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- G. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
- H. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
- I. Install glazing in mockups specified to match glazing systems required for Project, including glazing methods:
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed work if undisturbed at time of Substantial Completion.
- J. Preconstruction Adhesion and Compatibility Testing:
 - 1. Test each glass product, tape sealant, gasket, glazing accessory, and glass framing member for adhesion to and compatibility with elastomeric glazing sealants:
 - a. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 - b. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - c. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 - d. Schedule enough time for testing and analyzing results to prevent delaying the Work.
 - e. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.
- K. Pre-installation Conference: Conduct conference at site.

1.7 WARRANTY

- A. Coated Glass Products - Written warranty signed by manufacturer in which glass manufacturer agrees to replace coated glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating:
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Laminated Glass - Written warranty signed by manufacturer in which manufacturer agrees to replace laminated glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard:
 - 1. Warranty Period: 10 years from date of Substantial Completion.

- C. Insulating Glass - Written warranty signed by manufacturer in which manufacturer agrees to replace insulating glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass:
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- D. Glass Film - Written warranty signed by glass film manufacturer and installer in which manufacturer and installer agree to replace glass film that crack, peel, delaminate, discolor, change appearance, or failure to meet solar criteria within specified warranty period:
 - 1. Warranty Period: 5 years from date of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by manufacturer.
- D. Exercise exceptional care to prevent edge damage to glass, and damage/deterioration to coating on glass.
- E. Comply with insulating glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1. Glass:
 - a. AGC Glass Company North America, Inc.
 - b. Cardinal Glass Industries.
 - c. Guardian Industries Corp.; SunGuard.
 - d. Oldcastle BuildingEnvelope.
 - e. Pilkington North America.
 - f. PPG Industries, Inc.
 - g. Vetrotech Saint-Gobain.
 - h. Viracon, Inc.
- B. Ceramic Coated Spandrel Glass:
 - 1. ASTM C1048, Condition B (spandrel glass, one surface ceramic coated), Type I (transparent glass, flat), Quality q3 (glazing select), Class 1 (clear), with ceramic coating applied to second surface and complying with the following requirements:
 - a. Class 1 (clear).
 - b. Class 2 (tinted, heat absorbing, and light reducing):
 - 1) Tint Color: Azurlite by Viracon; Blue; Blue-green; Bronze; EverGreen by Viracon; Green; Gray.

- 2) Kind HS (heat strengthened); Kind FT (fully tempered).
- 3) Coating Location: Second surface.
- 4) Ceramic Coating Color: Selected by Architect from manufacturer's full range.

2.2 INSULATING GLASS

- A. Insulated Glass Units:
1. Low-E Coated - Double pane with silicone sealant edge secondary seal and polyisobutylene primary seal with aluminum spacer, clear anodized. Outboard lite of 1/4 inch heat-strengthened glass, ASTM C1048, Kind HS. Inboard lite of 1/4 inch clear tempered, Kind FT, glass, Category I, CPSC 16 CFR 1201. Category II for units less than 18" above floor, and top edge greater than 36". Low-E coating on surface 3, interpane space purged dry air; total unit thickness of one inch:
 - a. PPG Solarban 70XL – Low- E Insulating Glass or equal:
 - 1) Solarban 70XL (2) Starphire + Clear:
 - a) Visible Light Transmittance of 64 %, shading coefficients of 0.32.
 - 2) Glazing U factor and solar heat gain coefficient shall be in accordance with National Fenestration Rating Council, NFRC 100 and NFRC 200.

2.3 GLAZING ACCESSORIES

- A. Compatibility: Provide glazing sealants compatible with one another and with other materials in contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of service and application, demonstrated by sealant manufacturer based on testing and field experience.
- B. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
- C. Colors of Exposed Glazing Sealants: Selected by Architect.
- D. Glazing Sealant - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 100/50, Use NT:
 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - d. Pecora Corporation.
 - e. Sika Corporation.
- E. Glazing Sealant - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT:
 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. BASF Corporation; Construction Systems.
 - b. Dow Corning Corporation.
 - c. GE Construction Sealants; Momentive Performance Materials Inc.
 - d. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - e. Pecora Corporation.
 - f. Polymeric Systems, Inc.
 - g. Sika Corporation.

- F. Glazing Sealant - Neutral curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use NT:
1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Bostik, Inc.
 - b. Dow Corning Corporation.
 - c. GE Construction Sealants; Momentive Performance Materials Inc.
 - d. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - e. Polymeric Systems, Inc.
 - f. Schnee-Morehead, Inc., an ITW company.
 - g. Sika Corporation.
- G. Glazing Sealant - Acid curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use NT:
1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. BASF Corporation; Construction Systems.
 - b. Bostik, Inc.
 - c. Dow Corning Corporation.
 - d. GE Construction Sealants; Momentive Performance Materials Inc.
 - e. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - f. Pecora Corporation.
 - g. Polymeric Systems, Inc.
 - h. Schnee-Morehead, Inc., an ITW company.
 - i. Sika Corporation.
- H. Back Bedding Mastic Glazing Tapes:
1. Preformed, butyl based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
 - a. Tape, where indicated.
 - b. Tape, for glazing applications in which tape is subject to continuous pressure.
 - c. Tape, for glazing applications in which tape is not subject to continuous pressure.
- I. Expanded Cellular Glazing Tapes:
1. Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - a. Type 1, for glazing applications in which tape acts as the primary sealant.
 - b. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- J. Miscellaneous Glazing Accessories:
1. Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with proven record of compatibility with surfaces contacted in installation:
 - a. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
 - b. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
 - c. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
 - d. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

- e. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- f. Perimeter Insulation for Fire Resistive Glazing: Product approved by testing agency listed and labeled fire resistant glazing product with which it is used for application and fire protection rating indicated.

2.4 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements:
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components:
 - a. Temperature Change: 120 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C), material surfaces.
 - 2. Edge and Surface Conditions: Comply with the recommendations of AAMA *Structural Properties of Glass* for clean cut edges, except comply with manufacturer's recommendations.
 - 3. Exposed Glass Edges and Surface Condition: Finish edges flat with an arrissed edge profile (small bevel of uniform width not exceeding 1.5 mm at an angle of approximately 45 degrees to the surface of the glass) with polished (surface is reflective in appearance similar to the major surface of the glass) surface.
- B. Cutting: Wheel cut or sawed edges and seamed at manufacturer's option. For site cut glass, provide glass 2 inches (50.8 mm) larger than required in both dimensions to facilitate cutting of clean cut edges without the necessity of seaming or nipping. Do not cut, seam, nip or abrade heat treated glass.
- C. Butt Glazing: Clean cut or flat grind vertical edges of butt glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- D. Edges: Grind smooth and polish exposed glass edges and corners.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 degrees F (4.4 degrees C).
- B. Field Measurements: Verify actual dimensions of openings and construction contiguous with decorative glass by field measurements before fabrication.

3.2 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

3.3 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation after correcting unsatisfactory conditions.

3.4 PREPARATION

- A. Clean glazing channels and framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates:
 - 1. Comply with manufacturer instructions for wiping of surfaces immediately before application of primers.
 - 2. Wipe metal surfaces with IPA (isopropyl alcohol) unless otherwise required by compatibility and adhesion testing results.
- B. Inspect each piece of glass immediately before installation. Do not install pieces improperly sized or with damaged edges, scratches, abrasion, or evidence damage. Remove labels from glass immediately after installation.
- C. Examine glazing units to locate exterior and interior surfaces. Label or mark units so exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.
- D. Seal vent (breather or capillary) tubes in insulating glass units in accordance with insulating glass manufacturer written recommendations.
- E. Glass Film Preparation:
- F. Remove particulate matter on the glass surface using a scraping blade.
- G. Place an absorbent towel on window sill or sash to absorb moisture generated by the film application.

3.5 GLAZING

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm):
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8 inch (3 mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement:
 - 1. Square cut wedge shaped gaskets at corners and install gaskets as recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.
- K. Tape Glazing:
 - 1. Position tapes on fixed stops so that, when compressed by glass, the exposed edges are flush with or protrude slightly above sightline of stops:
 - a. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make tapes fit opening.
 - b. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
 - c. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
 - d. Do not remove release paper from tape until right before each glazing unit is installed.
 - e. Apply heel bead of elastomeric sealant.
 - f. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
 - g. Apply cap bead of elastomeric sealant over exposed edge of tape.
- L. Gasket Glazing (Dry):
 - 1. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation:
 - a. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

- b. Installation with Drive in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
 - c. Installation with Pressure Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
 - d. Install gaskets to protrude past face of glazing stops.
- M. Sealant Glazing (Wet):
1. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance:
 - a. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
 - b. Tool exposed surfaces of sealants to provide a substantial wash away from glass.
- N. Structurally Glazed Units:
1. Set full height continuous structural gaskets/spacers to vertical mullions. Set glass units with void between edge of units and head/sill channel, but with units fully within head/sill rebate so as to provide a proper bite:
 - a. Align glass unit edges over vertical mullion continuous structural gasket/spacers and secure with manufacturers recommended temporary cleats.
 - b. Structurally seal glass unit to vertical mullions with specified one part structural silicone sealant. Tool structural silicone flush in alignment to mullion face and perpendicular to face of interior glass light; remove excess structural silicone from glass and metal substrates.
 - c. After full cure of structural silicone sealant remove temporary cleats. Immediately seal holes left in the vertical mullions caused by temporary cleats.
 - d. Insert and shape weatherseal joint backer rods, or gaskets, into vertical void between glass units and at a proper depth to receive silicone weatherseal sealant.
 - e. Place silicone weatherseal sealant into void and tool flush with adjacent exterior glass light faces; remove excess sealant from glass and metal substrates.
- O. Glass Film Overlay:
1. Apply squarely aligned to glass edges, uniformly smooth, and free from tears, air bubbles, wrinkles, and rough edges, in pattern/design indicated on Drawings to the interior face of clean glass, according to manufacturer's written instructions, using the squeegee technique to remove moisture:
 - a. Cut film edges neatly and square at a uniform distance of 1/16 inch (1.5 mm) to 1/32 inch (0.75 mm) of the window sealing device. Avoid scoring glass when cutting film.
 - b. Clean film and leave free of soap residue and squeegee marks.

- P. Erection Tolerances:
1. Maximum Deviation from Vertical: 1/8 inch in any story and 1/4 inch in any 45 foot run.
 2. Maximum Deviation from Horizontal: 1/8 inch in any 30 foot run.
 3. Maximum Deviation from True Alignment: 1/32 inch for any two (2) abutting units.
Allow no edge projections.
 4. Maximum Joint Gap: 1/32 inch.

3.6 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains:
1. If contaminating substances come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

PART 4 SCHEDULE

4.1 GLAZING SCHEDULE

- A. **GL1** Insulated Glass (Exterior): 1 inch (25 mm) sealed insulated unit consisting of an exterior lite of 6 mm (1/4 inch) low-e tinted tempered float glass, 1/2 inch gas filled air space, and 6 mm (1/4 inch) clear tempered float glass interior lite.
- B. **SP** Ceramic Coated Spandrel Glass (Exterior): 1 inch (25 mm) VE1-48 insulating spandrel unit consisting of 6 mm (1/4 inch) clear VE-48 #2, 1/2" air space and 6 mm (1/4 inch) clear with Viraspan V903 #4.

END OF SECTION 08 80 00

SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 1. Gypsum Board.
 2. Exterior Gypsum Board for Ceilings and Soffits.
 3. Reinforced Gypsum Board Sheathing (Tile Backer Board).
 4. Cementitious Backer Units.
 5. Sound Attenuation Insulation.
 6. Exterior gypsum board sheathing.
 7. Accessories necessary for a complete installation.

1.3 RELATED SECTIONS

- A. Section 03 30 00: Cast-In-Place Concrete.
- B. Section 05 40 00: Cold Formed Metal Framing.
- C. Section 09 30 00: Tiling.

1.4 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: Comply with manufacturer's load tables and the following design pressures and deflections:
 1. Stairs, Elevator Hoistways, and Vertical Shafts: 1/120 at 10 psf.
 2. Partitions Receiving Lath and Plaster: 1/360 at 15 psf.
 3. Partitions Receiving Monitors, Televisions, Heavy Audio/Visual Equipment: 1/360 at 15 psf.
 4. Typical Partitions: 1/240 at 5 psf.
 5. Other Partitions: 1/240 at 5 psf.
 - a. Maximum Deflection:
 - 1) L/240 at 5 lbf per sq. ft.
 - 2) L/120 at 5 lbf per sq. ft.
 - 3) L/120 at 7.5 lbf per sq. ft.
 - 4) L/120 at 10 lbf per sq. ft.
- B. Fire Resistance Rated Assemblies: For fire resistance rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- C. STC Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.5 SUBMITTALS

- A. Product Data: Submit For each type of drywall including calculations for loadings and stresses of exterior walls and specially fabricated framing based on manufacturer's load tables.
- B. Shop Drawings: Indicate locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.
- C. Samples:
 - 1. Trim Accessories: Full size Sample in 12 inch (300 mm) long length for each trim accessory indicated.
 - 2. Textured Finishes: 12 inch by 12 inch (300 mm by 300 mm) for each textured finish indicated and on same backing indicated for Work.
- D. Calculations: Submit calculations verifying steel partition stud minimum base metal thickness and depth compliance with Code and ASTM C645 for height, load, and deflection.
- E. Evaluation Reports: ICC-ES reports for dimpled steel studs and runners and firestop tracks.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. CBC 2022 California Building Code. CCR Title 24, Part 2, as adopted and amended by DSA.
 - a. CBC-7 – Chapter 7, Fire Resistant Materials and Construction
 - b. CBC-19A – Chapter 19A, Concrete
 - c. CBC – Chapter 25, Gypsum Board and Plaster.
 - 2. Division of the State Architect, Interpretation of Regulations (DSA-IR)
 - a. DSA-IR 25-3, Drywall Ceiling Suspension Conventional Construction-One Layer.
 - b. DSA-IR 25-5.13, Metal Suspension Systems for Lay in Panel Ceilings.
 - 3. Fire Resistance Rated Assemblies: For fire resistance rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
 - 4. All gypsum boards to be mildew and mold resistant, with a score of 10 on ASTM D3273.
- B. Single Source Responsibility:
 - 1. Framing Members: Obtain steel framing members from single manufacturer.
 - 2. Panel Products: Obtain each type of gypsum board and other panel products from single manufacturer.
 - 3. Finishing Materials: To the extent possible, obtain finishing materials from same manufacturer supplying gypsum board products. When not possible, obtain materials from manufacturer acceptable to gypsum board manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 for gypsum board manufacturer's written instructions, whichever are more stringent.
 - 1. Do not install paper faced gypsum panels until installation areas are enclosed and conditioned.
- B. Room Temperatures: Maintain minimum 40 degrees F (4 degrees C). For adhesive attachment and finishing of gypsum board, maintain minimum 50 degrees F (10 degrees C) for 48 hours before application and continuously after until dry. Do not exceed 95 degrees F (35 degrees C) when using temporary heat sources.
- C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.
- D. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.9 WARRANTY

- A. Warrant the work specified for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials or workmanship.
- B. In addition, provide warranty from the manufacturer for the following products:
 - 1. Exterior sheathing weathering warranty covering in-place exposure damage to exterior sheathing for twelve (12) months.
 - 2. Exterior sheathing warranty against manufacturing defects for five (5) years.
 - 3. Tile backer board warranty against manufacturing defects for Twenty (20) years.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Gypsum Board:
 - a. Georgia Pacific.
 - b. National Gypsum Company.
 - c. USG Corporation.
 - d. Comparable product.
 - 2. Tile Backer Board:
 - a. Georgia Pacific, Dens-Shield Tile Baker
 - b. USG, Durock Tile Backer.
 - c. Comparable product.
 - 3. Water Resistant Gypsum Board:
 - a. Mold Tough VHI Firecode X, by USG
 - b. Gold Bond Hi-Impact XP, by National Gypsum
 - Comparable product.

4. Cementitious Board:
 - a. Custom Building Products
 - b. National Gypsum Company
 - c. United States Gypsum company

- B. Gypsum Board: ASTM C 1396/C 1396M, applicable to type of gypsum board indicated and whichever is more stringent.
 1. Core: Use Type X throughout
 - a. Thickness: 5/8 inch (15.9 mm).
 - b. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

 2. Ceiling Type: Manufactured for sag resistance
 - a. Thickness: 1/2 inch (13mm).
 - b. Long Edges: Tapered.

 3. Moisture and Mold Resistant Type: Type X with moisture and mold resistant core and surfaces. Core:
 - a. Thickness: 5/8 inch (15.9 mm).
 - b. Long Edges: Tapered.

- C. Reinforced Gypsum Sheathing (Tile Backer Board): ASTM C 1278/C 1278M, standard edges. Cellulose fiber reinforced panels may be used in lieu of cementitious board.
 1. Core and Thickness: 1/2 inch (12.7 mm) or 5/8 inch (15.9 mm) to match conditions, Type X.
 2. Long Edge: Tapered.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

- D. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325.
 1. Thickness: 1/2 inch (12.7 mm)
 2. Long Edges: Standard.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

- E. Shaft Liner Boards: ASTM C 1396 and ASTM C 1658.
 1. Thickness: 1 inch.
 2. Width: 2 feet.
 3. Weight: 4.0 lb per sq. ft.
 4. Edges: Double Bevel
 5. R-Value: ASTM C 518 ,not less than 0.65.
 6. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
 7. Microbial Resistance: ASTM D 6329, will not support microbial growth.
 8. Basis of Design: Densglass Shaftliner by Georgia Pacific.

- F. Exterior Gypsum Sheathing Board: Backside of Parapet Walls, behind stucco, under soffits; ASTM C1177; moisture resistant, and fire resistant, Type X, 1/2 inch thick, maximum permissible length, ends square cut, inorganic glass fiber mat faced, 48 inch width, DensGlass Exterior Sheathing by Georgia Pacific, USG Securock Glass-Mat, Gold Bond Brand e²XP Extended Exposure Sheathing by NationalGypsum, GlasRoc Brand Sheathing by BPB America or equal. Install Weather Resistive Barrier at exterior wall over sheathing substrate:
 1. Weather barrier as specified and detailed.

- G. Exterior Trim: ASTM C 1047, hot dip galvanized steel sheet, plastic, or rolled zinc.
 1. Shapes:
 - a. Cornerbead.
 - b. LC Bead: J shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One piece, rolled zinc with V shaped slot and removable strip covering slot opening.

- H. Interior Trim: ASTM C 1047; galvanized or aluminum coated steel sheet, rolled zinc, plastic, or paper faced galvanized steel sheet.
1. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC Bead: J shaped; exposed long flange receives joint compound.
 - d. L Bead: L shaped; exposed long flange receives joint compound.
 - e. U Bead: J shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
- I. Continuous Corner: Extruded Aluminum; continuous integral fin for surface contact with gypsum board; 7/8 inch (22 mm) wide, tapered to edge; punched with holes staggered to accept screw fastening. Prime with corrosion resistant primer. Provide Pittcon Softforms SO-HSE-90 or Schluter.
1. Basis of Design: Pittcon Softforms SO-HSE-90; Subject to compliance with requirements, provide basis of design or comparable by one of the following:
 - a. Fry Reglet Corporation.
 - b. Pittcon Industries.
 - c. Schluter.
- J. Joint Treatment: ASTM C 475/C 475M.
1. Joint Tape:
 - a. Exterior Gypsum Soffit Board: Paper.
 - b. Joint Compound for Exterior Applications, Glass Mat Gypsum Sheathing Board: Recommended by sheathing board manufacturer.
 - c. Joint Tape, Interior Gypsum Board: Paper.
 2. Joint Compound:
 - a. Gypsum Board: Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting type taping compound.
 - 1) Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting type taping compound.
 - a) Use setting type compound for installing paper faced metal trim accessories.
 - 2) Fill Coat: For second coat, use setting type, sandable topping compound.
 - 3) Finish Coat: For third coat, use setting type, sandable topping compound.
 - 4) Skim Coat: For final coat of Level 5 finish, use setting type, sandable topping compound.
 - b. Cementitious Units: Recommended by backer unit manufacturer.
 - c. Tile Backing Panels: Recommended by backer unit manufacturer.
 - d. Water Resistant Gypsum Backing Board: Use setting type taping compound and setting-type, sandable topping compound.
- K. Auxiliary Gypsum Materials: Comply with referenced installation standards and manufacturer's written recommendations.
1. Steel Drill Screws: ASTM C 1002, use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

2. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - a. Fire Resistance Rated Assemblies: Comply with mineral-fiber requirements of assembly.
3. Acoustical Sealant: Nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti, Inc.
 - 2) Pecora Corporation.
 - 3) Specified Technologies, Inc.
 - 4) United States Gypsum Company.
4. Reveal Moldings: Extruded aluminum moldings, reveals, control joints. All intersections shall be factory fabricated with joints heliarc welded and backs sealed with permanent waterproof tape. Furnish with 6 inch legs to join with straight sections. Provide connector clips at butt joints of straight sections and end caps at terminations. Color/finish as selected by Architect.
 - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1) Fry Reglet Corp.
 - 2) Gordon, Inc.
 - 3) MM Systems Corporation.
 - 4) Pittcon Industries.
 - 5) Or equal.
 - b. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, alloy 6063-T5.
 - c. Finish: Anodized finish, Class II medium etch 0.40 mils, AA-M12C22A31, color per Architect.
 - d. Refer to drawings for types and sizes.
5. Access Doors: Refer to Section 08 31 13 for Access Doors to be provided at gypsum board walls and/or ceilings.

2.2 FINISH

- A. For surfaces exposed to view provide level 3 orange peel finish. For concealed surfaces refer to Part 3.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow metal frames, cast in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
- B. Gypsum Board Assemblies: Comply with requirements in ASTM C 840 applicable to framing installation.

- C. Install gypsum board in accordance with ASTM C840, GA 201, GA 216 and Section 2508 California Building Code. Conform to DSA, IR 25-3.
- D. Sound Insulation: Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- E. Gypsum Panels: Comply with ASTM C 840. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
 - 1. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
 - 2. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
 - 3. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
 - 4. Form control and expansion joints with space between edges of adjoining gypsum panels.
 - 5. Cover both faces of support framing with gypsum panels in concealed spaces, except in chases braced internally.
 - a. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - b. Fit gypsum panels around ducts, pipes, and conduits.
 - c. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4 inch to 3/8 inch (6.4 mm to 9.5 mm) wide joints to install sealant.
 - 6. Isolate perimeter of gypsum board applied to nonload bearing partitions at structural abutments, except floors. Provide 1/4 inch to 1/2 inch (6.4mm to 12.7mm) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
 - 7. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- F. Gypsum Board: Install interior gypsum board where indicated on drawings.
 - 1. Single Layer Application:
 - a. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 - b. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire resistance rated assembly, and minimize end joints. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - c. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
 - 2. Multilayer Application:
 - a. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - b. On Z shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

- c. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

- G. Backing Panels:
 - 1. Cementitious Backer Units: ANSI A108.11; install where indicated with 1/4 inch (6.4 mm) gap where panels abut other construction or penetrations. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

- H. Exterior Gypsum Board Soffits: 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.

- I. Trim Accessories: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Attach trim according to manufacturer's written instructions.
 - 1. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
 - 2. Exterior Trim: Install in the following locations:
 - a. Cornerbead: Use at outside corners.
 - b. LC Bead: Use at exposed panel edges.
 - 3. Interior Trim: Install in the following locations:
 - a. Cornerbead: Use at outside corners, unless otherwise indicated.
 - b. Bullnose Bead: Use at outside corners.
 - c. LC Bead: Use at exposed panel edges.
 - d. L Bead: Use where indicated or necessary.
 - e. U Bead: Use at exposed panel edges.

- J. Gypsum Board Finishing: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
 - 1. Prefill open joints, rounded or beveled edges, and damaged surface areas.
 - 2. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
 - 3. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - a. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - b. Level 2: Panels that are substrate for tile.
 - c. Level 3: Surfaces to be coated with orange peel finish.

3.3 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 21 16

SECTION 09 23 00 GYPSUM PLASTERING

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. Gypsum plastering on expanded-metal lath.
 - 2. Gypsum plastering on diagonal wood furring strips.
- B. Related Sections:
 - 1. Section 06 10 00; Rough Carpentry.

1.3 SUBMITTALS

- A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockups for each substrate and finish texture indicated for gypsum plastering, including accessories and expansion joints.
 - 2. Where applicable, provide suitable backing to match existing and flush finish feathering.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover, and keep them dry and protected against damage from weather, moisture, direct sunlight, contamination, corrosion, construction traffic, and other causes.

1.6 FIELD CONDITIONS

- A. Comply with ASTM C 842 requirements or gypsum plaster manufacturer's written recommendations, whichever are more stringent.
- B. Room Temperatures: Maintain temperatures at not less than 55 deg F (13 deg C) or greater than 80 deg F (27 deg C) for at least seven days before application of gypsum plaster, continuously during application, and for seven days after plaster has set or until plaster has dried.

- C. Avoid conditions that result in gypsum plaster drying out too quickly.
 - 1. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
 - 2. Maintain relative humidity levels for prevailing ambient temperature that produce normal drying conditions.
 - 3. Ventilate building spaces in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Where indicated, provide gypsum plaster assemblies identical to those of assemblies tested for fire resistance according to ASTM E 119 by a qualified testing agency.
- B. Sound-Transmission Characteristics: Where indicated, provide gypsum plaster assemblies identical to those of assemblies tested for STC ratings according to ASTM E 90 and classified according to ASTM E 413 by a qualified testing agency.

2.2 EXPANDED-METAL LATH

- A. Expanded-Metal Lath: ASTM C 847, cold-rolled carbon-steel sheet with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized-zinc coating.
 - 1. Diamond-Mesh Lath:
 - a. Type: Self-furring.
 - b. Weight: 2.5 lb/sq. yd. (1.4 kg/sq. m)
 - 2. Flat-Rib Lath: For contour finishes: Rib depth of not more than 1/8 inch (3 mm), 2.75 lb/sq. yd. (1.5 kg/sq. m).
 - 3. 3/8-Inch (10-mm) Rib Lath: For studless applications; 3.4 lb/sq. yd. (1.8 kg/sq. m)

2.3 WOOD LATH

- A. Where applicable to match existing (Primarily wall construction): Wood lath strips: 1/4" X 1 1/2" X 4'-0" long of white pine, Spruce, fir, redwood straight-grained woods. Wood lath strips installed diagonally or to match existing. Space 1/4" butt joints and 3/8" separations between strips. Use staple or bra sized appropriately. Common nails may be used. Wood lath is not to be used for ceiling applications.
- B. Do not apply used lath. When applying Gypsum, pre-wet the wood lath. Lath must be damp when mortar is applied. Best practice is to wet lath the day before depending on outside temperature.

2.4 ACCESSORIES

- A. General: Comply with ASTM C 841, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required. Where applicable when wood lath is used to match existing provide accessories best suited for the wood lath.
- B. Metal Accessories:
 - 1. Cornerite: Fabricated from expanded-metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized-zinc coating.
 - 2. Striplath: Fabricated from expanded-metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized-zinc coating.

3. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.
 - a. Smallnose cornerbead with expanded flanges; use unless otherwise indicated.
 - b. Smallnose cornerbead with perforated flanges; use on curved corners.
 - c. Smallnose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing unit masonry corners.
 - d. Bullnose cornerbead, radius 3/4-inch (19-mm) minimum, with expanded flanges; use at locations indicated on Drawings.
4. Casing Beads: Fabricated from **zinc-coated (galvanized) steel**; square-edged style; with expanded flanges.

2.5 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Bonding Compound: ASTM C 631.
- C. Fasteners for Attaching Metal Lath to Substrates: ASTM C 841.
- D. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter unless otherwise indicated.
- E. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing), produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of rated assembly.
- F. Mix Additives: Use gypsum plaster accelerators and retarders from plaster manufacturer if required by Project conditions. Use only additives that manufacturer recommends in writing for use with plaster to which it is added.

2.6 BASE-COAT PLASTER MATERIALS

- A. High-Strength Gypsum Neat Plaster: ASTM C 28/C 28M, with a minimum, average, dry compressive strength of 2800 psi (19 MPa) according to ASTM C 472 for a mix of 100 lb (45 kg) of plaster and 2 cu. ft. (0.06 cu. m) of sand.
- B. Aggregates for Base-Coat Plasters: ASTM C 35, sand and perlite.

2.7 FINISH-COAT PLASTER MATERIALS

- A. High-Strength Gypsum Gaging Plaster: ASTM C 28/C 28M, with a minimum, average, dry compressive strength of 5000 psi (34 MPa) according to ASTM C 472 for a neat mix.
- B. Lime: ASTM C 206, Type S, special finishing hydrated lime.

2.8 PLASTER MIXES

- A. Mixing: Comply with ASTM C 842 and manufacturer's written instructions for applications indicated.
- B. Mix Additives: Use accelerators and retarders, if required by Project conditions, according to manufacturer's written instructions.

- C. Water containing salts, alum, or water containing plaster residue accelerates plaster set and may cause efflorescence. Water containing organic or vegetable matter may retard plaster set, cause staining, and interfere with plaster bond.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

3.3 INSTALLATION, GENERAL

- A. Sound-Attenuation Blankets: Where required, install blankets before installing lath unless blankets are readily installed after lath has been installed on one side.
- B. Acoustical Sealant: Where required, seal joints between edges of plasterwork and abutting construction with acoustical sealant.

3.4 INSTALLING EXPANDED-METAL LATH

- A. Expanded-Metal Lath: Install according to ASTM C 841.
 - 1. Partition Framing and Vertical Furring: Install **flat-rib** lath.
 - 2. Flat-Ceiling and Horizontal Framing: Install **flat-rib** lath.
 - 3. On Solid Surfaces, Not Otherwise Furred: Install self-furring, diamond-mesh lath.

3.5 INSTALLING ACCESSORIES

- A. General: Install according to ASTM C 841.
- B. Cornerbeads: Install at external corners.
- C. Casing Beads: Install at terminations of plasterwork, except where plaster passes behind and is concealed by other work and where metal screeds, bases, or frames act as casing beads.

3.6 PLASTER APPLICATION

- A. General: Comply with ASTM C 842.
 - 1. Do not deviate more than plus or minus 1/8 inch in 10 feet (3 mm in 3 m) from a true plane in finished plaster surfaces when measured by a 10-foot (3-m) straightedge placed on surface.
 - 2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
 - 3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

- B. Base-Coat Plaster:
 - 1. Over Expanded-Metal Lath:
 - a. Scratch Coat: High-Strength Gypsum neat plaster with job-mixed sand
 - b. Brown Coat: High-Strength Gypsum neat plaster with job-mixed sand
- C. Finish Coats:
 - 1. Smooth-Troweled Finishes:
 - a. Materials: High-strength gypsum gaging plaster and lime putty.
 - b. Locations: Provide smooth-troweled finish at all interior locations unless otherwise indicated.
- D. Concealed Plaster:
 - 1. Where plaster application is concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.
 - 2. Where plaster application is concealed above suspended ceilings and in similar locations, omit finish coat.
 - 3. Where plaster application is used as a base for adhesive application of tile and similar finishes, omit finish coat.

3.7 PLASTER REPAIRS

- A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.8 CLEANING AND PROTECTION

- A. Remove temporary protection and enclosure of other work after plastering is complete. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09 23 00

SECTION 09 30 00 TILING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements including but not limited to:
 - 1. Ceramic mosaic tile.
 - 2. Accessories required for indicated installation.
- B. Related Sections:
 - 1. Section 09 21 16: Gypsum Board Assemblies.
 - 2. Section 09 65 13.13: Resilient Base.

1.3 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction:
 - 1. Level Surfaces: Minimum 0.6.
 - 2. Ramp Surfaces: Minimum 0.8.
- B. Ceramic Tile Flooring should be stable, firm, and slip resistant, pursuant to CBC Section 11B-302.1.

1.4 SUBMITTALS

- A. Product Data: Technical data including data sheets, installation recommendation, and recommended joint widths.
- B. Shop Drawings - Show locations of each type of tile and tile pattern:
 - 1. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples - Submit samples showing full range of color and texture variations expected:
 - 1. Full size units of each type and composition of tile and for each color and finish required.
 - 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required; minimum 12 inches (300 mm) square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed work.
 - 3. Waterproof membrane in 6 x 6-inch sample.
 - 4. Thresholds in 6-inch (150 mm) lengths.
- D. Test Reports: Submit test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of tile products with requirements for slip resistance.
- E. Maintenance Instructions: Submit maintenance instructions for each type of product specified.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Building Code: Comply with applicable requirements for the CBC for interior finishes.
 - 2. Surface Burning Characteristics - ASTM E84; identify products with appropriate markings of applicable testing agency:
 - a. Flame Spread Index: 25 or less.
 - b. Smoke Developed Index: 450 or less.
 - 3. Accessibility Requirements - Comply with applicable requirements:
 - a. Americans with Disabilities Act of 1990, as amended:
 - 1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design.
 - b. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA):
 - 2) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
- B. Source Limitations for Tile: Obtain tile of same type and color or finish from one source or producer. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- D. Source Limitations for Other Products - Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:
 - 1. Stone thresholds.
 - 2. Waterproofing.
 - 3. Joint sealants.
 - 4. Cementitious backer units.
 - 5. Metal edge strips.
- E. Mockups:
 - 1. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
 - a. Build mockup of each type of floor tile installation.
 - b. Build mockup of each type of wall tile installation.
 - c. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided. Store liquid materials in unopened containers and protected from freezing.
- C. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

PART 2 PRODUCTS

2.1 MATERIALS

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated. Provide tile complying with Standard grade requirements.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting:
 - 1. For factory mounted tile, provide back or edge mounted tile assemblies as standard with manufacturer unless otherwise indicated:
 - a. Where tile is indicated for installation in swimming pools, on exteriors or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.2 TILE PRODUCTS

- A. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1. Ceramic Tile:
 - a. American Marazzi Tile, Inc.
 - b. American Olean; a Division of Dal-Tile Corporation.
 - c. Crossville, Inc.
 - d. Daltile.
 - e. Emser Tile.
 - f. Trinity Tile.
 - g. Interceramic.
 - h. Concept Surfaces, LLC.
- B. Ceramic Floor Tile - Factory mounted unglazed ceramic mosaic tile:
 - 1. Basis of Design Product/Manufacturer: As indicated in the Drawings.
 - 2. Type: As indicated in the Drawings.
 - 3. Module Size: Refer to Finish Schedule in the Drawings.
 - 4. Thickness: 1/4 inch (6.4 mm).
 - 5. Face: Plain with cushion edges.
 - 6. Surface: Smooth, without or slip resistant, with abrasive admixture.
 - 7. Dynamic Coefficient of Friction: Not less than 0.42.
 - 8. Location: As indicated in the Drawings.
 - 9. Grout Color: As indicated in the Drawings.
 - 10. Tile color: As indicated on Drawings or as selected by Architect.
- C. Ceramic Wall Tile - Glazed tile:
 - 1. Basis of Design Product/Manufacturer: **Daltile**
 - 2. Composition: Impervious natural clay tile.
 - 3. Module Size: 4 1/4 inches, square.
 - 4. Thickness: 5/16 inch (8 mm).
 - 5. Face: Plain with cushion edges.
 - 6. Surface: Matte glazed.

7. Base: Six (6) inch high x Six (6) inch wide ceramic tile cove base to match wall tile.
 8. Tile Color and Pattern: Refer to Drawings.
 9. Grout Color: Selected by Architect unless noted otherwise.
 10. Trim Units - Coordinated with sizes and coursing of adjoining flat tile where applicable matching characteristics of adjoining flat tile. Provide shapes selected from standard shapes:
 - i. Wainscot Cap for Thinset Mortar Installations: Surface bullnose, module size 1 inch by 1 inch (25.4 mm by 25.4 mm) or 2 inch by 1 inch (50.8 mm by 25.4 mm) or 2 inch by 2 inches (50.8 mm by 50.8 mm).
 - j. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it, same size as adjoining flat tile.
 - k. External Corners for Thinset Mortar Installations: Surface bullnose, module size 1 inch by 1 inch (25.4 mm by 25.4 mm) or 2 inch by 1 inch (50.8 mm by 25.4 mm) or 2 inch by 2 inches (50.8 mm by 50.8 mm).
 - l. Internal Corners: Cove, module size 1 inch by 1 inch (25.4 mm by 25.4 mm) or 2 inches by 1 inch (50.8 mm by 25.4 mm).
 - m. Internal Corners: Field-buttet square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.
 - n. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch (12.7 to 6.4 mm) across nominal 4 inch (100 mm) dimension.
- D. Threshold - Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes:
1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.
 2. Granite Thresholds - ASTM C615/C615M, with polished finish:
 - a. Description: Uniform, medium grained, black stone without veining.

2.3 WATERPROOF MEMBRANE

- A. Waterproof membrane complies with ANSI A118 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fluid Applied Membrane - Liquid latex rubber or elastomeric polymer:
1. Basis of Design - Laticrete 9235 Waterproofing Membrane. Subject to compliance with requirements, provide basis if design or comparable product by one of the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. TEC; H.B. Fuller Construction Products Inc.
- C. Fabric Reinforced, Fluid Applied Membrane - System consisting of liquid latex rubber or elastomeric polymer and continuous fabric reinforcement:
1. Basis of Design - Laticrete 9235 Waterproofing Membrane and reinforcing Fabric. Subject to compliance with requirements, provide basis if design or comparable product by one of the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. Merkrete by Parex USA, Inc.

- D. Latex Portland Cement Waterproof Mortar - Flexible, waterproof mortar consisting of cement based mix and latex additive:
 - 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. C-Cure.
 - b. MAPEI Corporation.
 - c. TEC; H.B. Fuller Construction Products Inc.

- E. Liquid Latex Waterproofing/Crack Isolation Membrane - Single Component, self-curing, load bearing liquid rubber polymer that forms a flexible seamless combined waterproofing membrane and crack isolation membrane compliance with ANSI A118:
 - 1. Basis of Design - Hydroban by Laticrete International. Subject to compliance with requirements, provide basis of design or comparable product by one of the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. TEC; H.B. Fuller Construction Products Inc.

2.4 CRACK ISOLATION MEMBRANE

- A. Crack isolation membrane complying with ANSI A118 for standard performance and recommended by manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

- B. Fabric Reinforced, Modified Bituminous Sheet - Self adhering, modified bituminous sheet with fabric reinforcement facing; 0.040-inch (1 mm) nominal thickness:
 - 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Custom Building Products.
 - b. MAPEI Corporation.

- C. Fluid Applied Membrane - Liquid latex rubber or elastomeric polymer:
 - 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. Merkrete by Parex USA, Inc.
 - e. TEC; H.B. Fuller Construction Products Inc.

- D. Fabric Reinforced, Fluid Applied Membrane - System consisting of liquid latex rubber or elastomeric polymer and fabric reinforcement:
 - 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Bonsal American, an Oldcastle company.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. Merkrete by Parex USA, Inc.

2.5 SETTING MATERIALS

- A. Dry Set Mortar (Thinset) - ANSI A108:
 - 1. Mortar Bed - Proportions of 1 part Portland Cement to 5 parts sand:
 - a. Portland Cement: ASTM C150, Type 1.
 - b. Sand: ASTM C144.
 - c. Water: Potable.

2. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 3. Wall Applications: Provide mortar complying with requirements for nonsagging mortar in addition to requirements in ANSI A108.
- B. Modified Dry Set Mortar (Thinset) - ANSI A118:
1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. TEC; H.B. Fuller Construction Products Inc.
 2. Provide prepackaged, dry mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid latex additive at site.
 3. Wall Applications: Provide mortar complying with requirements for nonsagging mortar in addition to requirements in ANSI A118.
- C. Improved Modified Dry Set Mortar (Thinset) - ANSI A118:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. TEC; H.B. Fuller Construction Products Inc.
 2. Provide prepackaged, dry mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid latex additive at Project site.
 3. For wall applications, provide mortar complying with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.
- D. Modified Dry Set Mortar (Medium Bed): ANSI A118; product approved by manufacturer for application thickness of 5/8 inch (16 mm).
1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. TEC; H.B. Fuller Construction Products Inc.
 2. Provide prepackaged, dry mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid latex additive at Project site.
- E. Portland Cement Mortar (Thickset) Installation Materials - ANSI A108:
1. Mortar Bed - Proportions of 1 part Portland Cement to 5 parts sand:
 - a. Portland Cement: ASTM C150, Type 1.
 - b. Sand: ASTM C144.
 - c. Water: Potable.
 2. Cleavage Membrane: Asphalt felt, ASTM D226/D226M, Type I (No. 15); or polyethylene sheeting, ASTM D4397, 4.0 mils (0.1 mm) thick.
 3. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, 2 by 2 inches (50.8 by 50.8 mm) by 0.062-inch (1.57 mm) diameter; comply with ASTM A1064, except for minimum wire size.
 4. Expanded Metal Lath - Diamond mesh lath complying with ASTM C847:
 - a. Base Metal and Finish for Interior Applications: Uncoated or zinc-coated (galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.

- b. Base Metal and Finish for Exterior Applications: Zinc coated (galvanized) steel sheet.
 - c. Configuration over Studs and Furring: Flat.
 - d. Configuration over Solid Surfaces: Self furring.
 - e. Weight: 3.4 lb/sq. yd. (1.8 kg/sq. m).
 - 5. Latex Additive: Styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex additive manufacturer for use with field mixed portland cement and aggregate mortar bed.
- F. Tile Setting Epoxy - ANSI A118, water cleanable; 100 percent solids epoxy grout:
- 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Polyblend Tile Grout with 100% Solids Epoxy; Custom Building Products.
 - b. SpectraLOCK PRO Stainless Grout; Laticrete International, Inc.
 - 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 degrees F and 212 degrees F (60 degrees C and 100 degrees C), respectively, and certified by manufacturer for intended use.
 - 3. Color: Selected by Architect.
- G. EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar (Thinset) - ANSI A118:
- 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. TEC; H.B. Fuller Construction Products Inc.
 - 2. Provide prepackaged, dry mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid latex additive at Project site.

2.6 GROUT MATERIALS

- A. Sand Portland Cement Grout - ANSI A108, consisting of white or gray cement and white or colored aggregate as required to produce color indicated:
- 1. Portland Cement: ASTM C150, Type 1.
 - 2. Lime: ASTM C206, Type S.
 - 3. Sand: ASTM C144.
- B. Commercial Cement Grout (Sanded Grout) - ANSI A118 for joints 1/8 inch (3.2 mm) or wider:
- 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - 2. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid latex form for addition to prepackaged dry grout mix.
- C. High Performance Tile Grout - ANSI A118:
- 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - 2. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid latex form for addition to prepackaged dry grout mix.
- D. Grout for PregROUTed Tile Sheets: Same product used in factory to pregrout tile sheets.

- E. Water Cleanable Epoxy Grout - ANSI A118:
 - 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Polyblend Tile Grout with 100% Solids Epoxy; Custom Building Products.
 - b. SpectraLOCK PRO Stainless Grout; Laticrete International, Inc.
 - c. MAPEI Corp., Kerapoxy or Kerapoxy CQ Epoxy Grout.
 - 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 degrees F and 212 degrees F (60 degrees and 100 degrees C), respectively, and certified by manufacturer for intended use.

2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex modified, portland cement-based formulation provided or approved by manufacturer of tile setting materials for installations indicated.
- B. Vapor Retarder Membrane: Polyethylene sheeting, ASTM D4397, 4.0 mils (0.1 mm) thick.
- C. Metal Edge Strips:
 - 1. Angle or L-shaped, height to match tile and setting bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless steel, ASTM A666, 300 Series exposed edge material.
 - a. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - 1) Blanke Corporation.
 - 2) Ceramic Tool Company, Inc.
 - 3) Schluter Systems L.P.
- D. 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.
- E. Tile and Grout Sealer - Sealer for sealing grout joints and that does not change color or appearance of grout:
 - 1. Manufacturers are subject to compliance with requirements; provide products by one of the following:
 - a. Custom Building Products.
 - b. Summitville Tiles, Inc.
 - c. TEC; H.B. Fuller Construction Products Inc.
- F. Sealant: Silicone sealant; refer to Section 07 92 00.

2.8 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.
- B. Contractor is required to achieve the specified concrete moisture content prior to installation of all flooring materials or use a flooring manufacture approved moisture barrier prior to installation of all flooring products.
- C. Maintain temperatures at 50 degrees F or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

3.2 EXTRA MATERIALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents:
 - 1. Tile and Trim Units: Furnish quantity of full size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

3.3 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed for compliance with requirements for installation tolerances and other conditions affecting performance of the work:
 - 1. Verify 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 for installations indicated.
 - 2. Verify concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108 for installations indicated:
 - a. Verify surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify 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 joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation after correcting unsatisfactory conditions.

3.4 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108 and is sloped 1/4 inch per foot (1:50) toward drains.

- C. Blending: For tile exhibiting color variations, verify 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 site before installing.

3.5 INSTALLATION

- A. Comply with TCNA *Handbook for Ceramic, Glass, and Stone Tile Installation* for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series *Specifications for Installation of Ceramic Tile* that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used:
 - 1. For the following installations, comply with ANSI A108 series procedures for tile installation standards for providing 95 percent mortar coverage:
 - a. Exterior tile floors.
 - b. Tile floors in wet areas.
 - c. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.
 - d. Tile floors consisting of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting bed thickness so tiles are flush.
- F. Jointing Pattern:
 - 1. Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated:
 - a. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - b. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - c. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- G. Joint Widths - Unless otherwise indicated, install tile with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/8 inch (3.2 mm).
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

- I. Expansion Joints:
 - 1. Provide expansion joints and sealant filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installing tiles:
 - a. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

- J. Thresholds:
 - 1. Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated:
 - a. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in modified dry set mortar (thinset).
 - b. Do not extend cleavage membrane waterproofing or crack isolation membrane under thresholds set in standard dry set, modified dry set or improved modified dry set mortar. Fill joints between such thresholds and adjoining tile set on cleavage membrane, waterproofing, or crack isolation membrane with elastomeric sealant.

- K. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

- L. Floor Sealer: Apply floor sealer to grout joints according to floor sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

- M. Waterproofing:
 - 1. Install waterproofing to comply with ANSI A108 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate:
 - a. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

- N. Crack Isolation Membrane:
 - 1. Install crack isolation membrane to comply with ANSI A108 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate:
 - a. Allow crack isolation membrane to cure before installing tile or setting materials over it.

- O. Floor and Paver Tile and Planks - Install tile to comply with requirements in the TCNA installation methods and ANSI A108 series of tile installation standards:
 - 1. Back Buttering - For installations indicated, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
 - a. Exterior tile floors.
 - b. Tile floors in wet areas, including showers, tub enclosures, laundries, and swimming pools.
 - c. Tile floors composed of tiles 8 inches by 8 inches (203 mm by 203 mm) or larger.
 - d. Tile floors composed of rib backed tiles.

- P. Floor Tile - Install tile to comply with requirements in the TCNA installation methods and ANSI A108 series of tile installation standards:
 - 1. Back Buttering - For installations indicated, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
 - a. Exterior tile floors.

- b. Tile floors in wet areas, including showers, tub enclosures, laundries, and swimming pools.
 - c. Tile floors composed of tiles 8 inches by 8 inches (203 mm by 203 mm) or larger.
 - d. Tile floors composed of rib backed tiles.
2. Tile Installation Method:
- a. Interior Floor Installations, Concrete Subfloor:
 - 1) TCNA F125-Full; thinset mortar on crack isolation membrane.
- Q. Wall Tile Installation:
- 1. Install types of tile designated for wall installations to comply with requirements, including those referencing TCNA installation methods and ANSI setting bed standards:
 - a. Back Buttering - For installations indicated, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
 - 1) Exterior tile wall installations.
 - 2) Tile wall installations in wet areas, including showers, tub enclosures, laundries, and swimming pools.
 - 3) Tile installed with chemical resistant mortars and grouts.
 - 4) Tile wall installations composed of tiles 8 inches by 8 inches (203 mm by 203 mm) or larger.
 - a. Tile Installation Method, Wood or Metal Studs:
 - 1) TCNA W245; thinset mortar on glass-mat, water-resistant gypsum backer board.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning:
 - 1. On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter:
 - a. Remove grout residue from tile as soon as possible.
 - b. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 09 30 00

SECTION 09 51 13 – ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 1. Acoustical panels.
 2. Concealed and exposed suspension systems for ceilings.
 3. Ceiling panel for food service area.
 4. Accessories necessary for a complete installation.

1.3 RELATED SECTIONS

- A. Section 07 92 00: Joint Sealants.

1.4 SUBMITTALS

- A. Product Data: Technical data for each product including installation instructions.
- B. Samples:
 1. Acoustic Panel: Set of 6 inch (150 mm) square samples of each type, color, pattern, and texture.
 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12 inch (300 mm) long samples of each type, finish, and color.
- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Suspended ceiling components.
 2. Structural members to which suspension systems will be attached.
 3. Size and location of initial access modules for acoustical panels.
 4. Items penetrating finished ceiling including but not limited to the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 5. Perimeter moldings.
- D. Maintenance Data: Manufacturer data for finishes for inclusion in maintenance manuals.
- E. Submit one copy of ICC-ES Reports.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 1. Building Code: Comply with applicable requirements of the CBC for interior finishes.
 2. DSA Interpretation of Regulations – IR 25-2.13 Metal Suspension Systems for Lay-in Panel Ceilings.

3. CBC - 2022 California Building Code.
 4. Chapter 19, 2022 California Building Code.
 5. Chapter 23, 2022 California Building Code.
 6. Acoustical Panel Standard: ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance.
 - a. Mounting Method for Measuring NRC: Plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface according to ASTM E 795.
 7. Surface Burning Characteristics: Ceiling panels with surface burning characteristics complying with CBC Section 808 and ASTM E 1264 for Class A materials determined by testing identical products in accordance with ASTM E 84:
 - a. Flame Spread Index : 25 or less
 - b. Smoke Developed Index: 450 or less.
 8. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 9. Fire Resistance Ratings: Comply with ASTM E 119; testing by qualified testing agency. Identify products with appropriate markings of applicable testing agency. Indicate design designations from UL *Fire Resistance Directory* or from the listings of another qualified testing agency.
- B. Source Limitations:
1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
 2. Suspension System: Obtain each type through one source from a single manufacturer.
- C. Comply with applicable regulations regarding toxic and hazardous materials.
1. Coating Based Antimicrobial Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment; and showing no mold or mildew growth when tested in accordance with ASTM D3273.
 2. Panel Based Antimicrobial Treatment: Provide acoustical panels manufactured with antimicrobial treatment in the panels.
- D. Preinstallation Conference: Conduct conference at site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to site in original, unopened packages and store in a fully enclosed, conditioned space protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, allow panels to attain room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.8 EXTRA MATERIALS

- A. Furnish extra materials matching products installed and packaged with protective covering for storage and identified with labels describing contents.
1. Acoustical Ceiling Panels: Full size panels equal to 5 percent of quantity installed.
 2. Suspension System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
 3. Hold Down Clips: Equal to 2 percent of quantity installed.
 4. Impact Clips: Equal to 2 percent of quantity installed.

1.9 WARRANTY

- A. Written warranty by manufacturer in which the manufacturer agrees to replace components that fail in materials or workmanship within the specified warranty period when subjected to use under normal conditions.
1. Failures include, but are not limited to, the following:
 - a. Sagging and/or warping of panels during the warranty period.
 - b. Panels which do not remain free from mold and/or mildew during the warranty period.
 - c. Suspension system which do not remain free from the occurrence of 50% red rust as defined by ASTM D610 test procedures during the warranty period.
 - d. Warranty period: thirty (30) years from the date of installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturer: Subject to compliance with requirements, provide ceiling panels and grid systems by one of the following:
1. Concealed and Exposed Suspension Grid
 - a. Armstrong World Industries, Inc.
 - b. CertainTeed Corporation.
 - c. USG Interiors.
 - d. Or approved equal.
 2. Acoustic Ceiling Panel:
 - a. Armstrong World Industries, Inc.
 - b. CertainTeed Corporation.
 - c. USG Interiors.
 - d. Or approved equal.
 3. Molding and Edge Trim:
 - a. Armstrong World Industries, Inc.
 - b. CertainTeed Corp.
 - c. USG Interiors, Inc.; Subsidiary of USG Corporation.
 - d. Or approved equal.
 4. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
 5. Acoustical Sealant for Concealed Joints:
 - a. Henkel Corporation; OSI Pro-Series SC-175 Acoustical Sound Sealant.
 - b. Pecora Corporation; AIS-919.

- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.2 METAL SUSPENSION SYSTEM

- A. Metal Suspension System: Direct hung metal suspension systems of types, structural classifications, and finishes indicated complying with applicable requirements in ASTM C 635/C 635M.
1. Products of following manufacturers form basis for design and quality intended.
 - a. Armstrong World Industries. Lancaster, PA. Products: Prelude XL, 15/16 inch Exposed Tee. Contact: Eric Hartzheim, Tel. 949.629.0306, Email enhartzheim@armstrong.com.
 2. High Humidity Finish: Comply with ASTM C 635/C 635M requirements for *Coating Classification for Severe Environment Performance* where high humidity finishes are indicated.
 3. Grid and Metal Suspension System: ASTM C635, Armstrong Prelude Heavy Duty XL 15/16" ceiling system, galvanized components die cut and interlocking.
 - a. Main Runners:
 - 1) Armstrong: Heavy Duty Prelude XL 7301, exposed T, (heavy duty).
 - 2) Cross Tees – "Stake-on end", Stepped End:
 - a) Armstrong: XL7328 (24 inch grid), XL7342 (48 inch grid).
 - 3) Edge Trim and accessories:
 - a) Armstrong Molding: 7877, 15/16" Shadow molding, 1/4" reveal.
 - b) BERC2 2" Retention Clips (Steel).
 - c) SJCG: Seismic Joint Clip CT (PeakForm)
 - d) 9/16" Shadow Reveal Transition Molding: #7901.
 - e) 15/16" Shadow Reveal Transition Molding: #7902.
 - 4) Beam End Retention Clip: slide clip for free end of main-runners and cross-tees with 2-inch movement capability.
 - a) Acceptable Product: Armstrong, BERC2, or comparable product.
 - 5) Retention Clips: Armstrong #414 Retention Clip or equal. At non-rated ceilings.
 - 6) Accessories: Stabilizer bars, panel stabilizer clips, adapters, splices, edge trim and all necessary components required for the specified suspended grid system.
 - 7) Grid Materials: main runners, cross runners, splices, expansion devices and intersection connectors, commercial quality cold rolled steel with galvanized coating. Designed to carry a mean ultimate test load on not less than 180 lbs. compression tension per ASTM E580 Section 5.1.2. The ceiling grid system must be rated as heavy duty as defined by ASTM C635
 - 8) Grid Finish: Prelude XL – factory applied standard white.
 - 9) Hanger Wire: No. 12 gauge wire shall be 0.106 inch in diameter conforming to ASTM A641. No. 12 gage wire shall be soft annealed, galvanized steel wire with a Class 1 zinc coating with a minimum tensile strength = 70 ksi.
 - 10) Compression Struts: As detailed in the drawings.
 - 11) Techzone Yoke: Armstrong TZYK.
 - 12) Techzone Bracing Clip: Armstrong TZBC.

2.3 ACOUSTICAL PANELS

- A. *Acoustic Panel: Vinyl Faced.*
1. *Basis of Design Product: Clean Room VL No. 870 by Armstrong World Industries.*
 2. *Classification: Provide fire resistance rated panels complying with ASTM E 1264 for type, form, and pattern:*
 - a. *Type and Form: Type IV, mineral base with membrane faced overlay; washable vinyl film overlay.*
 - b. *Pattern: GH (smooth and printed).*
 3. *Color: White.*
 4. *LR: Not less than 0.80.*
 5. *CAC: Not less than 40.*
 6. *Edge/Joint Detail: Square.*
 7. *Thickness: 5/8 inch (15 mm).*
 8. *Modular Size: 24 by 48 inches (610 by 1219 mm).*
 9. *Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.*
 10. *Location: Serving Area and as identified on plans*

2.4 MOLDING, TRIM AND ACCESSORIES

- A. *Shadow Molding: Where an acoustical lay in ceiling abuts a gypsum board ceiling in the same plane, provide a "W" shaped reveal or "shadow" molding similar to USG No. MS 174.*
- B. *Light Fixture Protection:*
1. *Manufacturer: Thermafiber Light Protection Kit by USG or Type 5/8 or 3/4 P(S) by Armstrong World Industries.*
 2. *Fire Resistance Rating: Same as ceiling assembly rating.*
 3. *Locations: At fixtures reinstalled in fire rated ceiling assemblies.*
- C. *Roll Formed, Sheet Metal Edge Moldings and Trim: Type and profile for standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color used for exposed flanges of suspension system runners.*
1. *Provide edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.*
 2. *For lay in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.*
 3. *For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.*
- D. *Extruded Aluminum Edge Moldings and Trim: Where indicated, provide extruded aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:*
1. *Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for Alloy and Temper 6063-T5.*
 2. *Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.*

3. Baked Enamel or Powder Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm). Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
- E. Acoustical Sealant: Comply with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
 2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut for compliance with requirements specified that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation after correcting unsatisfactory conditions.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less than half width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. Install acoustical panel ceilings to comply with ASTM C 636/C 636M and DSA IR 25-2.13 and seismic design requirements indicated, according to manufacturer's written instructions and *CISCA Ceiling Systems Handbook*.
- B. Suspend ceiling hangers from building's structural members and as follows:
 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers where required and, if permitted with fire resistance rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacing's that interfere with location of hangers at spacing's required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures. Refer to drawing for allowed attachment methods.

5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures. Refer to drawing for allowed attachment methods.
 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels/ or other supplemental support for attachment of hanger wires.
 7. Do not attach hangers to steel deck tabs.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Refer to drawing for allowed attachment methods.
- D. Panel Accessibility: Install panels downward accessible by disengaging hinge support rail on one side of panel from the T Bar Flange or optional A Mount rail flange without the use of tools, for access without removal of panel from the ceiling.
- E. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- F. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- G. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels with pattern running in one direction parallel to long axis of space.
 2. For square edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 4. Install hold-down clips in areas indicated, in areas with exterior opening larger than 48" x 96", where required by authorities having jurisdiction, and for fire resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
 5. Install clean room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
 6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire resistance rated assembly.

3.4 FIELD QUALITY CONTROL

- A. The Inspector of Record shall perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
 - 1. 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. Within each test area, testing agency will select one of every 10 powder-actuated fasteners and post installed anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two post installed anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
 - b. When testing discovers fasteners and anchors that do not comply with requirements, test in conformance with Section 1916A.7 2016 California Building Code.
- B. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.
- C. Shot-in anchors in concrete are not permitted for bracing wires.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

SECTION 09 65 13 - RESILIENT BASE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 - 1. Rubber base
 - 2. Accessories necessary for a complete installation.

1.3 SUBMITTALS

- A. Product Data: Technical data for each type of product including manufacturer's installation instructions.
- B. Samples: Sample of Base Selected or Color Chart if none selected.
- C. Maintenance Data: Submit for inclusion in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Entity having minimum 5 years documented experience who employs workers competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store base and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 degrees F (10 degrees C) or more than 85 degrees F (29 degrees C). Store floor tiles on flat surfaces.

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 degrees F (21 degrees C) or more than 85 degrees F (29 degrees C), in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 degrees F (13 degrees C) or more than 95 degrees F (35 degrees C).
- C. Close spaces to traffic for 48 hours after installation.

1.7 EXTRA STOCK

- A. Furnish extra materials matching products installed and packaged with protective covering for storage and identified with labels describing contents.
 - 1. Resilient Base: 1 percent of quality installed or 2 full unopened containers, whichever is greater.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Basis of Design Product: Manufacturers and tile series, pattern, and color selections are indicated in the Finish Schedule and are a basis of design. Subject to compliance with requirements, provide product indicated in Finish Schedule or comparable product by one of the following:
 - 1. Flexco Floors.
 - 2. Johnsite, a division of Tarkett Group.
 - 3. Mannington Commercial.
 - 4. Roppe.
- B. Rubber Base: ASTM F1861.
 - 1. Material: Rubber, vulcanized, Type TS, Style B.
 - 2. Manufacturing Method: Group I (solid, homogeneous).
 - 3. Style: Topset cove; minimum 100 foot coil, cut to length required.
 - 4. Minimum Thickness: 0.125 inch (3.2 mm).
 - 5. Color: Refer to the Drawings.
 - 6. Height: 4 inches, unless indicated otherwise.
 - 7. Outside Corners: Job formed.
 - 8. Inside Corners: Job formed.
- C. Adhesives: Water resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified for other work and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation after correcting unsatisfactory conditions. Installation of resilient flooring and accessories indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Immediately before installation, sweep clean substrates to be covered by resilient base.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for installing flooring. Scribe and cut flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Extend flooring into toe spaces, door reveals, closets, and similar openings.
- B. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- C. Resilient Base: Comply with manufacturer's written instructions for installing resilient base. 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.
 - 1. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
 - 2. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - 3. Do not stretch resilient base during installation.
 - 4. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
 - 5. Preformed Corners: Install preformed corners before installing straight pieces.
 - 6. Job Formed Corners:
 - a. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
 - b. Form without producing discoloration (whitening) at bends.
 - c. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
 - 1) Miter or cope corners to minimize open joints.

END OF SECTION 09 65 13

SECTION 09 65 23 LUXURY VINYL TILE FLOORING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes requirements limited to:
 - 1. Luxury vinyl floor tile.
 - 2. Accessories necessary for a complete installation.
- B. Related Sections:
 - 1. Section 03 30 00: Cast-In-Place Concrete.
 - 2. Section 09 65 13.13: Resilient Base.

1.3 SUBMITTALS

- A. Product Data: Technical data for each type of product including manufacturer's installation instructions.
- B. Shop Drawings - For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built in furniture, cabinets, and cutouts:
 - 1. Show details of special patterns.
- C. Samples - Full size units of each color and pattern of floor tile required:
 - 1. Luxury Vinyl Tile (LVT) flooring: 18 inch by 18 inch (460 mm by 460 mm) tile in each color selected and 12 inch long piece of base material in each color selected for approval.
- D. Product Schedule: Submit for floor tile using same designations indicated on Drawings.
- E. Maintenance Data: Submit for inclusion in maintenance manuals.
- F. Reports: Certified Moisture Testing Results.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Fire Test Response Characteristics - For resilient tile flooring, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency:
 - a. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
 - b. Smoke Density: Maximum specific optical density of 450 per ASTM E662.
 - 2. Accessibility Requirements - Comply with applicable requirements:
 - a. U.S. Architectural and Transportation Barriers Compliance Board Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG).
 - b. 2010 ADA regulations.
 - c. 2022 CBC Section 11B-302.1.

- B. Installer Qualifications: Entity having minimum 5 years documented experience who employs workers competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
- C. Contractor is required to achieve the specified concrete moisture content prior to installation of all flooring materials or use a flooring manufacture approved moisture barrier prior to installation of all flooring products. Contractor shall provide certified moisture testing results per ASTM F2170 (*Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes*) to Architect and Owner prior to floor installation. Acceptable moisture content of concrete sub floor shall be within approved manufacture limits or lower prior to installation.
- D. Source Limitations:
 - 1. Tile: Obtain floor products of same type and color or finish from one source or producer. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
 - 2. Setting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

1.5 WARRANTY

- A. Warrant the Work specified herein for ten (10) years against becoming unserviceable or causing an objectionable appearance resulting from either defective, or nonconforming materials and workmanship.
- B. Defects shall include, but not be limited to, the following:
 - 1. Damaged tile, including broken or chipped edges.
 - 2. Loose or missing tile.
 - 3. Noticeable deterioration or discoloring of tile or grout.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 degrees F (10 degrees C) or more than 85 degrees F (29 degrees C). Store floor tiles on flat surfaces.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Basis of Design Product:
 - 1. Manufacturers and tile series, pattern, and color selections are indicated in the Finish Schedule and are a basis of design. Subject to compliance with requirements, provide product indicated in Finish Schedule or comparable product by one of the following:
 - a. Luxury Vinyl Tile (LVT):
 - 1) Basis of Design: **Colonnade by Bentley Color to be approved by District**
 - 2) Alternates include:
 - a) Mohawk
 - b) Karndean.
 - c) Aspecta.
 - d) Armstrong.
 - e) Patcraft.
 - f) Tandus Centiva.

- g) Other comparable product.
- B. Luxury Solid Vinyl Tile (LVT-1) - ASTM F1700:
 - 1. Class I, monolithic vinyl tile:
 - a. Type A: Smooth surface.
 - b. Type B: Embossed surface.
 - 2. Thickness: 0.125 inch (3.2 mm).
 - 3. Size: Refer to Finish Schedule.
 - 4. Construction: Heterogeneous Resilient Flooring with .030" (30 mil) high density wear layer.
 - 5. Colors: As selected by Architect from manufacturer's available colors.
 - 6. Patterns: Factory mounted patterns as selected by Architect.
- C. Trowelable Leveling and Patching Compounds: Latex modified, portland cement based formulation provided or approved by floor tile manufacturer for applications indicated.
- D. Adhesives: Water resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- E. Floor Polish: Provide protective, liquid floor polish products recommended by floor tile manufacturer.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 degrees F (21 degrees C) or more than 85 degrees F (29 degrees C), in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 degrees F (13 degrees C) or more than 95 degrees F (35 degrees C).
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Where demountable partitions, cabinets, and similar items are indicated for installation on top of resilient tile flooring, install tile before these items are installed.
- F. Do not install flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive, as determined by flooring manufacturer's recommended bond and moisture test.
- G. Install flooring after other finishing operations, including painting, have been completed.

3.2 EXTRA STOCK

- A. Furnish extra materials matching products installed and packaged with protective covering for storage and identified with labels describing contents:
 - 1. LVT Flooring: 1 percent of quality installed or 2 full unopened containers, whichever is greater.

3.3 EXAMINATION

- A. Examine substrates for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work:
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified for other Work and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation after correcting unsatisfactory conditions. Installation of resilient flooring and accessories indicates acceptance of surfaces and conditions.

3.4 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates - Prepare according to ASTM F710:
 - 1. Verify substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing - Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F2170. Proceed with installation only after substrates have a maximum **95** percent relative humidity level.
 - 5. Bond Test: Bond 3' x 3' panels spaced 50 feet apart throughout subfloor area. After moisture test proves floor acceptably dry, install panels using adhesive. If panels are securely bonded after 72 hours, subfloor is sufficiently clean of foreign materials for satisfactory installation of resilient flooring.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed:
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.5 INSTALLATION

- A. Comply with manufacturer's written instructions for installing flooring. Scribe and cut flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Extend flooring into toe spaces, door reveals, closets, and similar openings.
- B. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- C. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one/half tile at perimeter:
 - 1. Lay tiles square with room axis.
- D. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles:
 - 1. Lay tiles with grain running in one direction.
- E. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built in furniture, cabinets, pipes, outlets, and door frames.
- F. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- H. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- I. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- J. Floor Tile - Comply with manufacturer's written instructions for installing floor tile:
 - 1. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one/half tile at perimeter:
 - a. Lay tiles square with room axis unless pattern indicated for an area.
 - 2. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles. Lay tiles with grain running in one direction.

- K. Resilient Accessories - Comply with manufacturer's written instructions for installing resilient accessories:
 - 1. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.6 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish. Apply two coat(s).
- E. Sealers and Finish Coats:
 - 1. Remove soil, visible adhesive, and surface blemishes from resilient terrazzo floor tile surfaces before applying liquid cleaners, sealers, and finish products:
 - a. Sealer: Apply two base coats of liquid sealer.
 - b. Finish: Apply two coats of liquid floor finish.
- F. Cover floor tile until Substantial Completion.
- G. Clean floor surfaces not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations:
 - 1. Before cleaning, strip protective floor polish.
 - 2. Reapply polish to floor surfaces to restore protective floor finish according to flooring manufacturer's written recommendations.

END OF SECTION 09 65 23

SECTION 09 68 00 CARPETING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 - 1. Carpet.
 - 2. Carpet Pad.
 - 3. Accessories necessary for a complete installation.
- B. Related Sections:
 - 1. Section 09 68 01: Carpeting Walk-off Mats.

1.3 DEFINITIONS

- A. Comparable Product: Product demonstrated and approved through submittal process, or where indicated as a produce substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

1.4 SUBMITTALS

- A. Product Data: Technical data including installation recommendations for each type of substrate:
 - 1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
- B. Samples: For each products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet: 12 inch (300 mm) square Sample from approved color and product of carpet.
 - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12 inch (300 mm) long Samples.
 - 3. Carpet Seam: 6 inch (150 mm) Sample.
 - 4. Mitered Carpet Border Seam: 12 inch (300 mm) square Sample. Show carpet pattern alignment.
 - 5. Carpet base and accessory samples.
- C. Product Test Reports: For carpet and carpet cushion, for tests performed by a qualified testing agency.
- D. Shop Drawings: Showing extent of product, seam direction, and location and type of carpet accessories. Submittal to indicate columns, doorways, enclosing walls or partitions, casework, and locations where cutouts are required.
- E. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.

2. Precautions for cleaning materials and methods that could be detrimental to carpet and carpet cushion.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 1. Building Code: Comply with applicable requirements for the CBC for interior finishes.
 2. Fire Test Response Characteristics: Provide products with the critical radiant flux classification determined by testing identical products in accordance with ASTM E 648. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
 3. Accessibility Requirements - Comply with applicable requirements:
 - a. Americans with Disabilities Act of 1990, as amended:
 - 1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design
 - 2) 2010 ADA regulations.
 - b. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA):
 - 1) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
 4. SCAQMD – South Coast Air Quality Management District Regulations Rule 1168 Adhesive and Sealant Applications.
 5. CRI – Carpet and Rug Institute Green Label Plus.
 6. Carpet shall have level loop, textured loop, or level-cut/uncutpile texture, firm cushion, pad or backing (or no cushion or pad) and maximum pile height of 1/2 inch in accordance with CBC Section 11B-302.2. Carpet edges shall comply with CBC 11B-302.2 and carpet trim to CBC Section 11B-303.
- B. Installer Qualifications: Installer having minimum 5 years documented experience as a commercial carpet installer, who is certified by the International Certified Floorcovering Installers Association at the Commercial II or higher certification level.
- C. Contractor is required to achieve the specified concrete moisture content prior to installation of all flooring materials or use a flooring manufacture approved moisture barrier prior to installation of all flooring products.
- D. Pre-installation Conference:
 1. Refer to Section 01 31 00: Project Management and Coordination.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.
- B. Store in a dry location between 65 degrees F and 90 degrees F and a relative humidity below 65%. Protect from damage and soiling. Stack carpet rolls horizontally, elevated above slab level on a flat surface, stacked no higher than two rolls.
- C. Store materials in area of installation for minimum period of 48 hours prior to installation.
- D. Protect carpet from damage, dirt, stains, and moisture.

1.7 WARRANTY

- A. Carpet: Written warranty in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.

- B. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
- C. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excessive surface wear, excess static discharge, and delamination.
- D. Warranty Period: 25 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Specifications are based on products of manufacturers named as the Basis of Design. Manufacturers listed whose product meet or exceed the specifications are approved for use on the Project. Other manufacturers must have a minimum of ten (10) years' experience manufacturing products meeting or exceeding the specifications and comply with Division 01 requirements regarding substitutions to be considered.
 - 1. Bentley Mills.
 - 2. Interface, LLC.
 - 3. J&J Flooring Group LLC.
 - 4. Mannington Mills. Inc.
 - 5. Mohawk Group.
 - 6. Patcraft
 - 7. Shaw Contract Group.
 - 8. Tandus-Centiva.
- B. General Carpet Requirements
 - 1. Performance:
 - a. Appearance Retention Rating: Severe traffic, 3.5 minimum according to ASTM D 7330.
 - b. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
 - c. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
 - d. Delamination: Not less than 4 lbf/in. (18 N/mm) per ASTM D 3936.
 - e. Tuft Bind: Not less than 5 lbf (22 N) according to ASTM D 1335.
 - f. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
 - g. Resistance to Insects: Comply with AATCC 24.
 - h. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC 165.
 - i. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) according to AATCC 16, Option E.
 - j. Antimicrobial Activity: Not less than 2 mm halo of inhibition for gram-positive bacteria; not less than 1 mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC 174.
 - k. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.
 - l. Emissions: Provide carpet that complies with testing and product requirements of CRI Green Label Plus.
 - m. Backing: Standard with manufacturer.
 - 2. Face Construction:
 - a. Gauge: 1/13 minimum.
 - b. Pile Units per Inch: 7.5 minimum.
 - c. Pile Height Average: 0.16 inch minimum.
 - d. Tuft Density: 104.96.
 - e. Fiber Content: Type 6 **OR** Type 6,6 Branded Manufacturer.
 - f. Dye Method: 50% Solution Dyed/50% Yarn Dyed minimum.

3. Backing Material
 - a. Basis of Design: Glass Back.
 - b. Primary Tufting Substrate: Synthetic nonwoven.
 - c. Soil/Stain Protection: As recommended by Manufacturer.
 - d. Preservation Protection: As recommended by Manufacturer.
 - e. Backing: Closed-Cell Vinyl Cushion
 - 1) Weight: 35.5 ounces per square yard
 - 2) Density: 18.5 lbs. per cubic foot
 - 3) Thickness: 5/32 inch.
 - 4) Compression Set: Maximum 10 percent
 - f. Adhesive System: Adhesive as recommended by manufacturer
 4. Total Product Weight: RS 83.0 ounces per square yard plus or minus 5 percent.
Product Testing Information:
 - a. Surface Flammability: Passes CPSC FF-1-70. (ASTM D2859).
 - b. Flooring Radiant Panel: Class 1 (mean average CRF: 0.45 watts per square centimeter or higher. (ASTM E648).
 - c. Electrostatic Propensity: 3.0 kV or lower. Permanent Conductive Fiber. (AATCC 134).
 5. Applied Soil Resistance Treatment: Standard with manufacturer.
 6. Antimicrobial Treatment: Standard with manufacturer.
 7. Adhesives: Water resistant, mildew resistant, non-staining, pressure sensitive type to suit products and subfloor conditions indicated, complying with flammability requirements for installed carpet and is recommended by carpet manufacturer for releasable installation.
 8. Trowelable Leveling and Patching Compounds: Latex modified, hydraulic cement based formulation provided or recommended by carpet cushion manufacturer.
 9. Adhesives: Water resistant, mildew resistant, non-staining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet and carpet cushion manufacturers.
 10. Seam Adhesive: Hot melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
 11. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.
 12. Extra Carpet: After completion of the carpet installation, the carpet subcontractor shall provide an additional three (3) percent of total yards installed of each carpet specified to the Owner for future carpet replacement that may be required. This extra stock is to be unused rolls, tiles, and mats and does not include scraps.
- C. Carpet Schedule
1. CPT-1: Basis of Design Walk-Off Carpet
 - a. Manufacturer: Abrasive Action II as manufactured by Tarkett Company
 - b. Construction: Accuweave Patterned Loop.
 - c. Gauge: 1/12 inch.
 - d. Stitches per inch: 8.0.
 - e. Tuft Density: 96.0 tufts/sq. in.
 - f. Pile Height Average: 0.187 inch.
 - g. Pile Thickness: 0.115 inch.
 - h. Fiber System: TDX Nylon.
 - i. Dye Method: 100% Solution Dyed.
 - j. Color(s): As selected by Architect from Manufacturer's extended color line.
 - k. Location(s): As indicated on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet and cushion manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Section 03 30 00: Cast-in-Place Concrete, for slabs receiving carpet.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

3.2 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet and carpet cushion until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpet and carpet cushion over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.
- E. Proceed with installation after correcting unsatisfactory conditions.

3.3 PREPARATION

- A. Comply with CRI 104, Section 7.3 *Site Conditions; Floor Preparation* and with carpet manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm), unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet and cushion manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.4 INSTALLATION

- A. Refer to Drawings and Finish Schedule for installation patterns.
- B. Comply with CRI 104 and carpet and carpet cushion manufacturer written installation instructions for the following:
 - Direct Glue Down Installation
 - Stair Installation
- C. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
 - 1. Do not bridge building expansion joints with carpet.
 - 2. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
 - 3. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.
- E. Install to comply with CRI 104.

3.5 CLEANING AND PROTECTING

- A. Perform cleaning operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face beater element.
- B. Protect installed carpet to comply with CRI 104.
- C. Protect carpet against damage from construction operations and placement of furniture, fixtures, and equipment during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer and carpet cushion manufacturer.

END OF SECTION 09 68 00

SECTION 09 72 19 - TACKABLE WALL COVERING

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 SYSTEM DESCRIPTION

- A. Uni-color, linoleum resilient homogeneous tackable surface consisting of linseed oil, granulated cork, rosin binders and dry pigments calendared onto natural burlap backing; color extending through thickness of material; with aluminum perimeter trim.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's specifications and technical data.
 - 2. Manufacturer's installation instructions.
- B. Samples: 8 inch by 10 inch samples showing manufacturer's full range of colors, textures and patterns for Architect's selection.

1.4 QUALITY ASSURANCE

- A. Wall covering shall be tested in accordance with ASTM E84. Class B
- B. Wall covering shall be tested in accordance with NFPA 253: Class II

1.5 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01 31 00 – Project Management and Coordination.

1.5 WARRANTY

- A. Warrant the Work specified herein for five (5) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
- B. Defects shall include, but not be limited to, delamination and noticeable deterioration or discoloring.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer listed is approved for use on the Project. Other manufacturers shall have a minimum of five (5) years experience manufacturing products meeting or exceeding those specified and shall comply with Division 1 requirements for substitutions in order to be considered.
 - 1. Koroseal Wallcoverings as distributed by RJF International, Houston, TX; (713) 205-0274; or Architect approved substitution.

- B. Basis of Design: "Walltalkers Tac-wall" pattern as manufactured by Koroseal Wallcoverings.

2.2 MATERIALS

- A. Vinyl Wall Covering:
 - 1. Physical Properties:
 - a. Width: 48 inches
 - b. Gauge: 1/4 inch
 - c. Backing: Burlap
 - d. Facing: Linoleum, self-healing.
 - e. Bacteria Resistance: Provide manufacturers standard anti-microbial additive.
 - f. Color(s): As indicated on drawings, or if not indicated, as selected by Architect from manufacturer's full range of colors.
- B. Perimeter Trim: Manufacturer's standard extruded aluminum trim, clear anodized finish unless otherwise indicated on drawings, with mitered corners, concealed mounting clips, fasteners, etc. as recommended by manufacturer.
- C. Adhesive. Solvent-free, manufactured or recommended by wallcovering manufacturer.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Do not begin until all walls are smooth and free of surface imperfections.
- B. Commencement of work will be an indication that the wall covering subcontractor accepts the scheduled walls as being free of imperfections.
- C. Apply adhesive in accordance with the printed instructions of manufacturer. Remove adhesive residue immediately.
- D. Before beginning application of wall covering, confirm products for uniform color, texture and quality.
- E. Apply wall covering from top to bottom, then side to side. Roll sheet firmly into adhesive to remove air bubbles.
- F. Butt joints tightly together.
- G. Trim vinyl wall covering to within 3/4 inch of top of scheduled base.
- H. Perimeter Trim: Overlap wall covering edges with perimeter trim and anchor trim securely to wall with concealed clips and fasteners as recommended by the wallcovering manufacturer. Butt trim joints tightly together; miter corner joints. Install trim in the longest continuous lengths practicable, with no horizontal trim piece less than 60 inches long, all around the perimeter of all tackable wallcovering panels. Install each vertical (end) trim member as a single piece.

3.2 CLEANING

- A. At completion of job, clean all paste residue and matter from surfaces with a neutral pH cleaning solution. Do not use abrasive cleaners.
- B. Assure that all joints have achieved continuous lamination.

END OF SECTION 09 72 19

SECTION 09 90 00 - PAINTING AND COATING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 1. Surface preparation and field painting of exposed items and surfaces.
 2. Field preparation and painting of factory primed metal products and fabrications.
 3. Accessories necessary for a complete installation,

1.3 DEFINITIONS

- A. Standard coating terms defined in ASTM D 16 apply.
 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85 degree meter.
 2. Eggshell refers to low sheen finish with a gloss range between 20 and 35 when measured at a 60 degree meter.
 3. Semigloss refers to medium sheen finish with a gloss range between 35 and 70 when measured at a 60 degree meter.
 4. Full gloss refers to high sheen finish with a gloss range more than 70 when measured at a 60 degree meter.

1.4 SUBMITTALS

- A. Product Data: Submit technical data and information for block fillers, primers, paints, and coatings, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
 1. Indicate manufacturer's instructions for special surface preparation procedures, substrate conditions requiring special attention.
 2. Material List: Provide inclusive list of required coating materials. Indicate each material and cross reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number, series, and general classification.
 3. Submit Zero VOC and/or SCAQMD compliant products only.
- B. Samples: Submit for each type of paint system and in each color and gloss of topcoat.
 1. Provide stepped samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. Provide list of material and application for each coat of each sample. Label each sample as to location and application.
 3. Submit samples on following substrates for review of color and texture only:
 - a. Concrete: Provide two 4 inch square samples for each color and finish.
 - b. Concrete Masonry: Provide two 4" x 8" samples of masonry, with mortar joint in the center, for each finish and color.
 - c. Painted Wood: Provide two 12 inch square samples of each color and material on hardboard.
 - d. Ferrous and Nonferrous Metals: Provide two 4 inch square samples of flat metal and two 8 inch long samples of solid metal for each color and finish.

- C. Product List: Submit list of including each paint system, color, and location of application. Use same product and location designations indicated in Finish Schedule.
- D. Closeout: Submit final schedule of colors with formulas per each paint color and sheen at project closeout.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with Federal and local toxicity and air quality regulations and with Federal requirements on content of for heavy metals including but not limited to: lead and mercury. Do not use solvents in paint products that contribute to air pollution.
 - 2. Comply with SCAQMD Rule1113 -7/01/2007
 - 3. Performance and Durability:
 - a. ASTM D 16 Standard Test Method for Load Testing Refractory Shapes at High Temperatures.
 - b. ASTM D 2486 Standard Test Method for Scrub Resistance of Interior Wall Paint.
 - c. ASTM D 2805 Standard Test Method for Hiding Power of Paints by Reflectometry.
 - d. ASTM D 4828 Standard Test Method for Practical Washability of Organic Coatings.
- B. Applicator Qualifications: A firm or individual having minimum 5 years documented experience in applying paints and coatings similar in material, design, and extent to those indicated.
- C. Installer Certifications: Submit documentation that all contractors which will impact surfaces coated with lead-based paints (coatings containing lead at 1.0mg/cm, or greater, if tested by XRF, or 5,000 mg/kg, or greater, if tested by paint chip samples), hold a current lead safe work certification, as required by 40 CFR 745.
- D. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees F (7 degrees C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply waterborne paints when temperatures of surfaces to be painted and surrounding air are between 50 degrees F and 90 degrees F (10 degrees and 32 degrees C).
- B. Do not thin or add water to water based paints, including water based alkyds.
- C. Weather Conditions:
 - 1. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
 - 2. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 degrees F (3 degrees C) above dew point; or to damp or wet surfaces.
 - 3. Minimum Application Temperatures for Water based Paints: Between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C).

- D. Apply solvent thinned paints when temperatures of surfaces to be painted and surrounding air are between 45 degrees F. and 95 degrees F (7 degrees F and 35 degrees C).
 - 1. Minimum Application Temperature for Varnish Finishes: 65 degrees F (18 degrees C) for interior or exterior, unless required otherwise by manufacturer's instructions.
 - 2. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.
- E. Provide lighting level of 80 foot candles (860lx) measured mid-height at substrate surface.
- F. Labels: Do not paint over Underwriters Laboratories, Factory Mutual, other code required labels, or equipment name, identification, performance rating, or nomenclature plates.

1.8 WARRANTY

- A. Written warranty signed by the manufacturer and the installer in which the manufacture and installer agree to repair or replace paint and primers that fail within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Flaking or delamination of paint with the substrate.
 - b. Rust, scale, similar imperfections due to improper surface preparation.
 - c. Thinning or watering of paint beyond that considered acceptable of paint manufacturer.
 - d. Failure to achieve dry film thickness (DFT) recommended by manufacturer for each coat in a paint system.
 - e. Deterioration or loss of color of paint beyond normal weathering.
 - 2. Warranty Period: One year from date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents, including mix design.
 - 1. Paint: 1 gallon (3.8 L) of each material and color applied.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Basis of Specifications: Sherwin Williams paints. Subject to compliance with requirements, provide first quality, 100% acrylic, commercial or industrial products of one of the specified manufacturers. Residential products are not permitted.
 - 1. Proprietary Names: Paint Schedule is based on a single manufacturer for convenience. Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that named products are required to the exclusion of comparable products of specified manufacturers. Furnish product technical data, including per cent solids by weight and volume; VOC content limits and emissions data; and certificates of performance for comparable paint products of specified manufacturer.
 - 2. Paint Products:
 - a. Sherwin-Williams Co.
 - b. Vista Paint
 - c. Dunn-Edwards Corporation
 - d. Or approved equal.

- B. **Material Compatibility:** Provide each paint system including block fillers, primers, and finish coats, that are compatible with one another and with substrates indicated under conditions of service and application, demonstrated by manufacturer based on testing and field experience.
- C. **Material Quality:** Provide manufacturer's best quality commercial paint 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. Residential quality paint products are not permitted.
- D. **Chemical Components of Interior Paints and Coatings:** Provide products complying with limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and SCAQMD Rule 1113 - 7/01/2007.
 - 1. **Aromatic Compounds:** Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 - 2. **Restricted Components:** Paints and coatings shall not contain components restricted by the EPA and the SCAQMD.
- E. **Accessories:** Materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
- F. **Patching Materials:** Latex filler compatible with paint systems.
- G. **Fastener Head Cover Materials:** Latex filler.
- H. **Colors:** Refer to drawings furnishing sheets and exterior elevations.

2.2 SOURCE QUALITY CONTROL

- A. **Testing of Paint Materials:** Owner reserves the right to invoke to engage the services of a qualified testing agency to sample paint materials.
 - 1. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to site, samples may be taken at the site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for maximum moisture content and conditions affecting performance of the work.
- B. Test substrates after repairing and cleaning substrates but prior to application of paint and coatings.
 - 1. **Maximum Moisture Content of Substrates:** When measured with an electronic moisture meter as follows:
 - a. Concrete: 12 percent.
 - b. Fiber Cement Board: 12 percent.
 - c. Masonry (Clay and CMUs): 12 percent.

- d. Wood: 15 percent.
 - e. Gypsum Board: 12 percent.
 - f. Plaster: 12 percent.
2. Test cementitious and plaster cement/stucco for alkalinity (pH).
- C. Gypsum Board Substrates: Verify taped joints are tapes and finishing compound is sanded smooth.
- D. Plaster Substrates: Verify plaster has fully cured. Verify existing plaster is in good condition and can receive new paint coating.
- E. Spray Textured Ceiling Substrates: Verify surfaces are dry.
- F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
1. Verify previously painted surfaces can be stripped to bare substrate, repaired if necessary, and prepared to receive new paint system consisting of primer and two top coats at a minimum.
 - a. Note: Previously painted surfaces have failed to accept new paint systems. Determined cause of failure and take corrective measures to ensure each surface accepts new paint system. Failure of new paint system is not permitted.
- G. Commence paint and coating application after correcting unsatisfactory conditions and surfaces are dry. Application of coating indicates applicator's acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Coordination of Work: Review work in which primers are provided to ensure compatibility of the total system for various substrates. Notify Architect of anticipated problems when using materials specified over substrates primed by others.
1. Preprimed Substrates: Inspect existing conditions in which primers are factory applied to ensure compatibility of the total system for each substrate. Notify Architect of anticipated problems when using the materials specified over factory primed or preprimed substrates.
 2. Existing Painted Surfaces: Inspect previously painted surfaces to ensure compatibility of the existing paints with new paint system for each substrate. Notify Architect of anticipated problems.
 3. Correct defects and clean surfaces affecting bond with paint system. Remove existing paints exhibiting loose surface defects showing signs of rust, scale, or delamination.
 4. Seal marks which may bleed through surface finishes.
- B. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified. Provide barrier coats over incompatible primers or remove and reprime. If removal is impractical or impossible because of size or weight of item, provide surface applied protection before surface preparation and painting
1. Remove hardware and hardware accessories, plates, lighting fixtures, and similar items that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface applied protection before surface preparation and painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
 2. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface applied protection if any.
 3. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

4. Clean and prepare surfaces to receive paint according to manufacturer's written instructions for each substrate condition and as specified. Provide barrier coats over incompatible primers, existing paint or coating, or remove and reprime.
 5. Correct defects and clean surfaces affecting bond with paint or coating system. Remove existing coatings exhibiting loose surface defects. Seal marks which may bleed through surface finishes.
- C. Cleaning: Before applying paint or surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning. Schedule cleaning and painting so dust and contaminants from the cleaning process will not fall on wet, newly painted surfaces.
1. Remove incompatible primers, including factory applied primers, and reprime substrate with compatible primers or apply barrier coat as necessary to produce desired paint systems indicated.
 2. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
 3. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
 4. Galvanized Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
 5. Aluminum Substrates: Remove surface oxidation.
- D. Mildew and Mold Removal: Remove mildew and mold by high power washing (pressure range of 1500 to 4000 psi) with solution of trisodium phosphate and bleach. If substrate is too soft for high power washing, scrub substrate with solution. Rinse with clean water and allow surface to dry.
- E. Protective Coverings: Provide protections for duration of the work, including covering furnishings and decorative items. Protect and mask adjacent finishes and components against damage, marking, overpainting, and injury. Clean and repair or replace damage caused by painting.
- F. Renovated Surfaces: Clean surface free of loose dirt and dust. Except at gypsum board surfaces, remove existing paint and coatings to bare substrate and prepare substrates to receive new paint system. Test substrate to verify it will bond with primer and receive new paint system without failure. If test fails, clean surface to base substrate and apply barrier coat. Retest to verify surface will accept new paint system.
1. Remove surface film preventing proper adhesion and bond.
 2. Wash glossy paint with a solution of sal soda and rinse thoroughly.
 3. Remove loose, blistered, and defective paint and varnish; smooth edges with sandpaper.
 4. Clean corroded iron and steel surfaces.
 5. Repair and blend into portland cement plaster.
 6. Prime bare surfaces.
 7. Tone varnished surfaces with stain bringing to uniform color.
 8. If existing surfaces cannot be put in acceptable condition for finishing by customary cleaning, sanding, and puttying operations, notify Owner and do not proceed until correcting unsatisfactory conditions.
- G. Cementitious Substrates: Prepare concrete surfaces to receive paint. Remove efflorescence, chalk, dust, dirt, grease, oils, release agents, mold, mildew, and existing paint. Roughen as necessary to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
1. Use abrasive blast cleaning methods if recommended by paint manufacturer.

2. Do not paint surfaces if moisture content or alkalinity of surfaces exceeds that permitted in manufacturer's written instructions.
 - a. Determine alkalinity and moisture content of surfaces by performing appropriate pH testing. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct condition prior to application of paint.
 - b. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m).
 - c. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation after substrates have obtained percent relative humidity level recommended by paint manufacturer.
 - d. Perform additional moisture tests when recommended by manufacturer. Proceed with installation when moisture content complies with that permitted in manufacturer's written instructions.
 - e. Remove stains caused by weathering of corroding metals with solution of sodium metasilicate after thoroughly wetting with water. Allow to thoroughly dry.
 3. Clean concrete floors to receive paint or coating with a 5 percent solution of muriatic acid or etching cleaner. Flush floors with clean water to remove acid; neutralize with ammonia, rinse, allow to dry; vacuum before painting.
- H. Ferrous Metals: Clean ungalvanized ferrous metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC recommendations.
1. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
 2. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 3. Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
- I. Galvanized Ferrous Metal Substrates: Clean galvanized surfaces with nonpetroleum based solvents leaving surface free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. Etch and prime prior to finish painting and rinse thoroughly.
- J. Shop Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop primed surfaces.
- K. Aluminum Substrates: Clean surfaces to remove oil, grease, surface oxidation, and contaminants in accordance with SSPC SP-1 Solvent Cleaning. Lightly abrade surface with a nonmetallic pad.
- L. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- M. Plaster/Stucco Substrates: Remove contaminants, release agents, curing compounds, efflorescence, chalk, mold, mildew, and similar deterrents. Spot patch existing plaster to eliminate blisters, buckles, excessive crazing, and to check cracking, dryouts, efflorescence, sweat outs, and similar defects to prevent plaster from bonding with paint or coatings. Sand or texture repair or patch to match adjacent finish and to remove trowel marks and arrises.
1. Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

2. Deep Cracks: Clean out and fill deep cracks with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
 3. Do not paint surfaces if moisture content or alkalinity of surfaces exceeds that permitted in manufacturer's written instructions. Test for alkali using litmus paper.
 4. Allow patching and repair compounds to set and cure before painting.
- N. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.
- O. Wood Substrates:
1. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 2. Sand surfaces that will be exposed to view, and dust off.
 3. Prime, stain, or seal wood to be painted. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 4. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 5. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- P. Pipe Covering and Insulation: Clean to remove loose, foreign, and objectionable material before applying sealing coat.
- Q. Preparation of Substrates for Wallcovering: Prime and seal substrate with release coat in accordance with wallcovering manufacturer's recommendations for substrate.
1. Assure compatibility with product of wall covering manufacturer.
 2. Fill indentations in substrate and prime with opaque white primer before applying release coat.
 3. Apply release coat in accordance with manufacturer's recommendations.
- R. Barrier Coat: Provide barrier coats over incompatible primers or remove and reprime. Notify Owner in writing of anticipated problems using specified finish coat material over previously coated substrates.
- S. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Do not use thinners for water based paints.
 4. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.
1. The term *exposed surfaces* includes areas visible when permanent or built in fixtures, grilles, convector covers, covers for finned tube radiation, and similar components are in place. Extend coatings in these areas to maintain system integrity and provide desired protection.
 2. Use applicators and techniques suited for paint and substrate indicated.

3. Provide finish coats compatible with primers.
 4. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 5. Paint exposed surfaces. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces.
 - a. Field painting of exposed surfaces include bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory applied final finish.
 - b. Areas visible when permanent or built in fixtures, grilles, convector covers, covers for finned tube radiation, and similar components are in place.
 - c. Extend coatings in areas, as required, to maintain system integrity and provide desired protection.
 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 7. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 8. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 9. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 10. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or surface imperfections. Cut in sharp lines and color breaks.
 11. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 12. Provide finish coats compatible with primers used.
 13. Sand lightly between each succeeding enamel or varnish coat.
- B. Items not to Receive Paint: Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
- C. Applicators: Apply paints and coatings by brush, roller, spray, or applicators recommended by manufacturer.
 1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool recommended by manufacturer for material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
 1. Measure film thickness on magnetic surfaces by use of Elcometer thickness gauge and on nonmagnetic surfaces by pit gauge or Tooke Gauge.
- E. Application: Apply first coat to surfaces that have been cleaned, pretreated, or prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.

2. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished after removing rust and scale and priming or touching up surface sand if acceptable to topcoat manufacturers.
 3. If undercoats, stains, or conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried and cured to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- F. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
1. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
 2. Prime and paint uninsulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, heat exchangers, tanks, ductwork, conduit, switchgear, and paintable insulation except where items are prefinished.
 3. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets visible through grilles and louvers with one coat of flat black paint, to visible surfaces. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
 4. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
 5. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated. Color band and identify with flow arrows, names, and numbering.
 6. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
 7. Concealed Members: Wherever steel and metal parts to receive paint are built into and concealed by construction, paint as specified for exposed parts so finish painting is complete before members are concealed.
- G. Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work: Painting is limited to items exposed in equipment rooms and occupied spaces.
1. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
 2. Prime and paint uninsulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, heat exchangers, tanks, ductwork, conduit, switchgear, and paintable insulation except where items are prefinished.
 3. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets visible through grilles and louvers with one coat of flat black paint, to visible surfaces. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
 4. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
 5. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated. Color band and identify with flow arrows, names, and numbering.
 6. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
- H. Electrostatic Spray Painting: Apply coating electrostatically to finished surfaces, free from runs, sags, visible overlaps, holidays, craters, pinholes and other defects detrimental to protective and decorative qualities of coating.
1. Thickness of Coatings: 1.5 to 2.0 mils dry film thickness. Measure dry film thickness with magnetic gauge.

2. Use application techniques, equipment, materials, and preparation procedures recommended by manufacturer.
- I. Block Fillers: Apply block fillers to concrete masonry block at rate to ensure complete coverage with pores filled.
- J. Prime Coats: Before applying finish coats, apply prime coat, recommended by manufacturer, to material required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or defects due to insufficient sealing.
- K. Finish Coats: Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance without bleed through.
 1. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or surface imperfections is not acceptable.
 2. Transparent (Clear) Finishes: Use multiple coats to produce glass smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections. Provide satin finish for final coats.
- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.
- M. Touch Up: Touch up marred, scraped, and blemished areas of surfaces which were factory primed or previously coated.
 1. Prepare and touch up scratches, abrasions, and blemishes and remove foreign matter before proceeding with succeeding coats.
 2. Touch up marred, scraped, and blemished areas of factory primed or previously coated surfaces.
 3. Feather touch up coating overlapping minimum 2 inches onto adjacent unblemished areas producing smooth, uniform surface.
 4. As soon after erection and installation as possible, touch up fasteners, welded surfaces and surroundings, field connections, and areas on which shop coat has been abraded or damaged with specified primer before corrosion and other damage occurs from exposure.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness (DFT) Testing: Tests for dry film thickness may be determined by using a Tooke Scale and microgroover, an electronic scanner, or the Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. It is of the utmost important to the District that the sites remain in a safe, clean, and well maintained condition. At the end of each day, leave the site ready to use by staff and students. Protect staff and students and the learning environment throughout the work.

- B. Cleanup: At the end of each day, remove empty cans, rags, rubbish, and discarded paint materials from site. After completion of painting work, clean glass and paint spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. Protect planting adjacent to buildings.
- E. Do not paint over existing transparent finishes.
- F. Provide *Wet Paint* signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work. After related work is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.
- G. At completion of painting activities, touch up and restore damaged or defaced painted surfaces.
- H. Waste Management: Legally dispose of unused paint and paint containers in accordance with manufacturer's recommendations and environmental regulations.

PART 4 - SCHEDULES

- A. The following is a schedule of typical painted items and does not specifically include every item that is to receive paint but should establish type and quality of finish for all items normally included in a complete paint job.
- B. Exterior Surfaces: Descriptions in schedule apply to new and previously painted surfaces. Number of coats listed is minimum, additional coat may be required to provide suitable uniform finish.
 - 1. Ferrous Metal (Semi-Gloss Enamel) Completely re-prime all shop primed items in field.
 - a. 1st coat: Dunn Edwards Bloc-Rust Primer BRPR00-1 Series.
 - b. 2nd and 3rd coats: Dunn Edwards Evershield EVSH50 Semi-Gloss
 - 2. Metal Deck (underside) and Supporting Structural Steel Members
 - a. 1st coat: Dunn Edwards Bloc-rust Primer BRPR00-1 Series.
 - b. 2nd and 3rd coats: Dunn Edwards Evershield EVSH50 Semi-Gloss.
 - 3. Galvanized Metal Railings (Gloss Urethane enamel) Only when previously painted
 - a. 1st coat: Metal Clean and Etch SCME-01.
 - b. 2nd coat: Dunn Edwards Ultragrip Multisurface Primer UGPR00.
 - c. 3rd and 4th coats: Dunn Edwards Evershield EVSH50 Semi-Gloss.
 - 4. Galvanized Metal Non-Railings (Miscellaneous Galvanized metals, underside of metal decking, flashing, etc.) Semi-Gloss enamel
 - a. 1st coat: Metal Clean and Etch SCME-01.
 - b. 2nd coat: Dunn Edwards Ultragrip Multisurface Primer UGPR00.
 - c. 3rd and 4th coats: Dunn Edwards Evershield EVSH50 Semi-Gloss.
 - 5. Cement Plaster and Exposed Concrete (Semi-Gloss) Flat only if over 8 feet high.
 - a. 1st coat: Dunn Edward Eff-Stop Select ESSL00.
 - b. 2nd and 3rd coats: Dunn Edwards Evershield Flat EVSH10.
 - 6. Wood (Flat if over 8 feet high)
 - a. 1st coat: Dunn Edwards E-Z Prime Premium EZPR00.
 - b. 2nd and 3rd coats: Dunn Edwards Evershield Flat EVSH10.
 - 7. Wood (Semi-gloss)
 - a. 1st coat: Dunn Edwards E-Z Prime Premium EZPR00.
 - b. 2nd and 3rd coats: Dunn Edwards Evershield EVSH50 Semi-Gloss.

8. New Concrete Block (Semi-Gloss) Flat only if over 8 feet high.
 - a. 1st coat: Dunn Edwards Blocfil Select SBSL00.
 - b. 2nd and 3rd coat: Dunn Edwards Evershield EVSH50 Semi-Gloss or Flat EVSH10.
 9. Existing Concrete Block (Semi-Gloss) Flat only if over 8 feet high.
 - a. 1st coat: Dunn Edwards Eff-Stop Select ESSL00.
 - b. 2nd and 3rd coats: Dunn Edwards Evershield EVSH50 Semi-Gloss or Flat EVSH10.
 10. Aluminum In-Fill Panels
 - a. 1st coat: Factory Prime coat (Touch up if abraded).
 - b. 2nd and 3rd coats: Dunn Edwards Evershield EVSH50 Semi-Gloss
 11. Cementitious Siding (Semi-Gloss) Flat if over 8 feet high.
 - a. 1st coat: Dunn Edwards Eff-Stop Select ESSL00.
 - b. 2nd and 3rd coat: Dunn Edwards Evershield EVSH50 Semi-Gloss or flat EVSH10.
- C. Interior Surfaces: Descriptions in schedule apply to new and previously painted surfaces. Number of coats listed is a minimum, additional coat may be required to provide suitable uniform finish.
1. New Gypsum Board (Semi-gloss at Walls, Gloss at Kitchen and Restroom Ceilings, and Flat at other ceilings, Enamel).
 - a. 1st coat: Dunn Edwards Vinylastic select VNSL00.
 - b. 2nd and 3rd coats: Dunn Edwards Evershield EVSH50 Semi-Gloss (for walls) Dunn Edwards Evershield EVSH60 (for gloss ceilings) Vista Paints, Duraglide 1000, flat, white (for flat ceilings).
 2. Existing Gypsum Board (Semi-Gloss at Walls, Floss at Kitchen and Restroom Ceilings, and flat at Ceilings, Enamel).
 - a. 1st coat: Dunn Edwards Interkote Premium IKPR00 or B-I-N Primer-Sealer Stain-Killer if necessary.
 - b. 2nd and 3rd coats: Dunn Edwards Evershield EVSH50 Semi-gloss (for walls) Dunn Edwards Evershield EVSH60 (for gloss ceilings) Dunn Edwards Spartawall flat SWLL10 (for flat ceilings).
 3. New or Existing Painted Wood (Semi-Gloss Enamel)
 - a. 1st coat: Dunn Edwards Interkote Premium IKPR00 or B-I-N Primer-Sealer Stain-Killer if necessary.
 - b. 2nd and 3rd coats: Dunn Edwards Evershield EVSH50 Semi-Gloss.
 4. New Wood to Receive Transparent finis (Stain and Lacquer)
 - a. 1st coat: Dunn Edwards Valpro Sanding Sealer NAS 2750.
 - b. 2nd and 3rd coats: Dunn Edwards Valpro Satin Lacquer NAF 2752.
 5. Existing Stained Wood (Varnish Finish)
 - a. 1st coat: Minwax Stain
 - b. 2nd and 3rd coats: Defthane Polyurethane Satin Varnish.
 6. Existing Stained Wood (Lacquer finish)
 - a. 1st coat: Stain to provide uniform finish, match existing tone Valspar Zenith Stain.
 - b. 2nd and 3rd coats: Dunn Edwards Valpro Satin lacquer NAF 2752.
 7. Ferrous Metal (Semi-Gloss Enamel) – Re-prime all shop primed items in field.
 - a. 1st coat: Dunn Edwards BLOC-Rust Premium BRPR00-1 series.
 - b. 2nd and 3rd coats: Dunn Edwards Evershield EVSH50 Semi-gloss
 - c. Typical paint system at hollow metal doors and frames.
 8. Cement Plaster and Exposed Concrete (Semi-Gloss at Walls, Gloss at Kitchen and Restroom Ceilings, and Flat at Ceilings, Enamel).
 - a. 1st coat: Dunn Edwards Ultra Grip Premium UGPR00 series or B-I-N Primer-Sealer Stain-Killer if necessary.
 - b. 2nd and 3rd coats: Dunn Edwards Evershield EVSH50 Semi-gloss (for walls) Dunn Edwards Evershield EVSH60 (for gloss ceilings) Dunn Edwards Spartawall Flat SWLL10 (for flat ceilings).

9. Acoustical Ceiling Tiles (Flat)
 - a. 1st coat: Dunn Edwards Ultra Grip Premium UGPR00 series or B-I-N Primer-Sealer Stain-Killer.
 - b. 2nd and 3rd coats: Dunn Edwards Acoustikote W615.
10. Galvanized and Zinc Alloy Metal, (Semi-gloss Enamel).
 - a. 1st coat: Metal Clean and Etch SCME-01.
 - b. 2nd coat: Dunn Edwards Ultra Grip Premium UGPR00 series.
 - c. 3rd and 4th coats: Dunn Edwards Evershield EVSH50 Semi-Gloss
11. Concrete Block (Semi-Gloss)
 - a. 1st coat: Dunn Edwards Blocfil Select SBSL00.
 - b. 2nd and 3rd coats: Dunn Edwards Evershield EVSH50 Semi-Gloss

END OF SECTION 09 90 00

SECTION 10 11 00 MARKERBOARD AND TACKBOARD

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 requirements including but not limited to:
 - 1. Visual display board assemblies.
 - 2. Floor to ceiling visual display assemblies.
 - 3. Rail support systems for visual display board assemblies.
 - 4. Modular support systems for visual display board assemblies.
 - 5. Sliding visual display units.
 - 6. Visual display conference units.
 - 7. Natural slate chalkboards.
 - 8. Glass markerboards.
 - 9. Display rails.
 - 10. Accessories necessary for a complete installation.
- B. Related Sections:
 - 1. Section 06 10 00: Rough Carpentry.
 - 2. Section 09 21 16: Gypsum Board Assemblies.
 - 3. Section 09 90 00: Painting and Coating.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Technical data for each type of product including construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units:
 - a. Include electrical characteristics for motorized units.
- B. Shop Drawings:
 - 1. Submit plans, elevations, sections, details, and attachment to other work:
 - a. Indicate sizes and layout, method of attachment, accessories, trim, details and finish.
 - b. Show locations of panel joints. Show locations of field assembled joints for factory fabricated units too large to ship in one piece.
 - c. Show locations and layout of special purpose graphics.
 - d. Include sections of typical trim members.
 - e. Include wiring diagrams for power and control wiring.
- C. Samples:
 - 1. Submit for each type of visual display unit indicated:
 - a. Visual Display Panel: Not less than 8-1/2 inches by 11 inches (215 mm by 280 mm), with facing, core, and backing indicated for final work. Include one panel for each type, color, and texture required.
 - b. Trim: 6 inch (150 mm) long sections of each trim profile.
 - c. Display Rail: 6 inch (150 mm) long section of each type.
 - d. Modular Support System: 6 inch (152 mm) long sections.

- e. Accessories: Full size Sample of each type of accessory.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface burning characteristics of tackboards.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Surface Burning Characteristics:
 - a. Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency:
 - 1) Flame Spread Index: 25 or less.
 - 2) Smoke Developed Index: 450 or less.
 - 2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 3. Accessibility Requirements:
 - a. Comply with applicable requirements:
 - 1) Americans with Disabilities Act of 1990, as amended:
 - a) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design.
 - 2) 2022 California Building Code (CBC) (CCR Title 24, Part 2, as adopted and amended by DSA):
 - a) CBC Chapter 11B, Public Buildings, Public Accommodations, Commercial Buildings, and Public Housing.
- B. Installer Qualifications: Entity having minimum 5 years documented experience that employs installers and supervisors who are trained and approved by manufacturer.
- C. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.
- D. Mockups:
 - 1. Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation:
 - a. Build mockup of typical wall area or visual display unit and floor to ceiling visual display assembly as shown on Drawings. Include accessories and temporary power.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - c. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Pre-installation Conference: Conduct conference at site.

1.5 WARRANTY

- A. Porcelain Enamel Face Sheets:
 - 1. Written warranty in which Manufacturer agrees to repair or replace porcelain enamel face sheets that fail in materials or workmanship within specified warranty period:
 - a. Failures include, but are not limited to, the following:
 - 1) Surfaces lose original writing and erasing qualities.
 - 2) Surfaces exhibit crazing, cracking, or flaking.
 - 3) Noticeable deterioration of finish.

- 4) Writing surface delamination.
 - 5) Fabric discoloration, tearing, or delamination.
 - 6) Unit releasing from substrate.
2. Warranty Period: 5 years from date of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. NACO.
- B. Equivalent manufacturers on approval.

2.2 MATERIALS

- A. Porcelain Enamel Face Sheet: PEI-1002, with face sheet two or three coat process.
- B. High Pressure Plastic Laminate: NEMA LD 3.
- C. Natural Cork Sheet: Seamless, single layer, compressed fine grain cork sheet; bulletin board quality; face sanded for natural finish with surface burning characteristics indicated.
- D. Plastic Impregnated-Cork Sheet: Seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto fabric backing; with washable vinyl finish and integral color throughout with surface-burning characteristics indicated.
- E. Vinyl Fabric: Mildew resistant, washable, complying with FS CCC-W-408D, Type II, burlap weave; weighing not less than 13 oz./sq. yd. (440 g/sq. m); with surface burning characteristics indicated.
- F. Polyester Fabric: Nondirectional weave, 100 percent polyester; weighing not less than 15 oz./sq. yd. (508 g/sq. m); with surface-burning characteristics indicated.
- G. Hardboard: ANSI A135.4, tempered.
- H. Particleboard: ANSI A208.1, Grade M-1.
- I. Medium Density Fiberboard: ANSI A208.2, Grade 130.
- J. Fiberboard: ASTM C208 cellulosic fiber insulating board.
- K. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- L. Extruded Aluminum: ASTM B221, Alloy 6063.

- M. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.
- N. Primer/Sealer: Mildew resistant primer/sealer recommended in writing by visual display unit manufacturer for intended substrate.

2.3 VISUAL DISPLAY BOARD ASSEMBLY

- A. Manufacturers:
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. Magnatag Visible Systems.
 - b. ABC School Equipment, Inc.
 - c. ADP.
 - d. AJW Architectural Products.
 - e. Architectural School Products Ltd.
 - f. Best-Rite; MooreCo, Inc.
 - g. Claridge Products and Equipment, Inc.
 - h. Egan Visual Inc.
 - i. EverWhite.
 - j. Ghent Manufacturing, Inc.
 - k. Marsh Industries, Inc.
 - l. Nelson Adams, Inc.
 - m. Peter Pepper Products, Inc.
 - n. Platinum Visual Systems.
 - o. Comparable product.
- B. Visual Display Board Assembly:
 - 1. Field or factory fabricated:
 - a. Assembly: Chalkboard, markerboard, and tackboard.
 - b. Corners: Fully-rounded corners.
 - c. Width: Indicated on Drawings.
 - d. Height: Indicated on Drawings.
 - e. Mounting Method: Direct to wall or Modular support system.
- C. Chalkboard Panel:
 - 1. High pressure laminate faced chalkboard panel on core indicated:
 - a. Color: Selected by Architect.
- D. Markerboard Panel:
 - 1. Single:
 - a. High pressure laminate faced markerboard panel on core indicated:
 - 1) Color: White
 - 2. Slider 3- panel and 4 – panel:
 - a. High pressure laminated faced markboards on sliders.
 - b. Color and Pattern: Selected by Architect.
- E. Tackboard Panel:
 - 1. Vinyl fabric faced tackboard panel on core indicated:
 - a. Fabric Wrapped Edge: Wrap edge of tackboard panel with fabric facing.
 - b. Color and Pattern: Selected by Architect.
- F. Aluminum Frames:
 - 1. Fabricated from not less than 0.062 inch (1.57 mm) thick, extruded aluminum; slim size and standard shape of size and shape indicated on Drawings:
 - a. Field Applied Trim: Snap on trim with no visible screws or exposed joints

- b. Aluminum Finish: Clear anodic finish.
 - c. Color and Pattern: Selected by Architect.
- G. Factory Applied Wood Trim: Red oak not less than 1/2 inch (13 mm) thick; standard size and shape with transparent finish.
- H. Vinyl Trim: Selected by Architect.
- I. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board as indicated on approved Shop Drawings.
- J. Combination Assemblies: Provide hidden spline between abutting sections of visual display panels.
- K. Chalktray:
 - 1. Continuous:
 - a. Box Type: Extruded aluminum with slanted front, grooved tray, and cast aluminum end closures.
 - b. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.
- L. Display Rail:
 - 1. Extruded aluminum display rail with plastic impregnated cork insert, end stops, and continuous paper holder, designed to hold accessories:
 - a. Size: 2 inches (50 mm) high by length indicated on Drawings.
 - b. Map Hooks: Two map hooks for every 48 inches (1200 mm) of display rail or fraction thereof.
 - c. Map Hooks and Clips: Two map hooks with flexible metal clips for every 48 inches (1200 mm) of display rail or fraction thereof.
 - d. Flag Holder: One for each room.
 - e. Tackboard Insert Color: Selected by Architect.
 - f. Aluminum Color: Match finish of visual display assembly trim.
- M. Paper Holder Display Rail: Extruded aluminum; designed to hold paper by clamping action.
- N. Special Purpose Graphics: Fuse or paint semivisible writing guidelines, penmanship lines, music staff lines, grid, 1 inch (25 mm) square, rectangular graph coordinates, [polar graph coordinates] [horizontal lines, 2 inches (50 mm) o.c., graphic onto surface of porcelain enamel visual display unit. Exact location to be determined by District.

2.4 VISUAL DISPLAY ASSEMBLIES

- A. Manufacturers:
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. Magnatag Visible Systems.
 - b. AJW Architectural Products.
 - c. Claridge Products and Equipment, Inc.
 - d. Egan Visual Inc.
 - e. Platinum Visual Systems.
- B. Markerboard Panel Assemblies:
 - 1. Consisting of markerboard panels with high pressure laminate facing on core indicated, fabricated for floor-to-ceiling assemblies:
 - a. Color: Selected by Architect.

- C. Tackboard Panel Assemblies:
 - 1. Consisting of tackboard panels with vinyl fabric or polyester fabric facing on core indicated, fabricated for floor to ceiling assemblies:
 - a. Edge Treatments:
 - 1) Panel Joint Edges: Wrapped with fabric.
 - 2) Top of Wall Edges: Wrapped with fabric.
 - 3) Bottom of Wall Edges: Wrapped with fabric.
 - 4) Corners: Wrapped with fabric.
 - b. Color: Selected by Architect.
- D. Width: As indicated on Drawings.
- E. Height: As indicated on Drawings.
- F. Joint Accessories: Unless otherwise indicated concealed aluminum or steel spline at butt joints.

2.5 MODULAR SUPPORT SYSTEM FOR VISUAL DISPLAY BOARD ASSEMBLIES

- A. Manufacturers:
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. AARCO Products, Inc.
 - b. Architectural School Products Ltd.
 - c. Claridge Products and Equipment, Inc.
 - d. Platinum Visual Systems.
- B. Standards:
 - 1. 72 inch (1829 mm) long extruded aluminum slotted standards designed for supporting visual display boards on panel clips. Space slots at not less than 4 inches (100 mm) o.c.:
 - a. Finish and color: As selected by Architect.
- C. Panel Clips: Extruded aluminum or steel with finish to match standards.

2.6 VISUAL DISPLAY CONFERENCE UNITS

- A. Manufacturers:
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. A-1 Visual Systems.
 - b. AARCO Products, Inc.
 - c. Architectural School Products Ltd.
 - d. Best-Rite; MooreCo, Inc.
 - e. Claridge Products and Equipment, Inc.
 - f. Egan Visual Inc.
 - g. Ghent Manufacturing, Inc.
 - h. Marsh Industries, Inc.
 - i. Peter Pepper Products, Inc.
 - j. Platinum Visual Systems.
- B. Visual Display Conference Units:
 - 1. Factory fabricated units consisting of hinged door wood cabinet with perimeter face frame, sides, and back; not less than 3 inch (75 mm) interior depth and designed for surface wall mounting. Fabricate inside of cabinet and cabinet doors with fixed visual display units:
 - a. Wood Cabinets - Fabricated from solid wood with integral, solid wood marker tray.

Fabricate hinged door panels with solid wood frame and wood veneer exterior surface:

- 1) Species and Finish: Red oak with natural lacquered finish.
- b. Plastic Laminate Cabinets - Cabinet and hinged door panels fabricated from high pressure, plastic laminate finished wood panels; with integral marker tray:
 - 1) Color: Selected by Architect.
- c. Hardware - Full height continuous hinges, wire door pulls, and door bumpers.
- d. Fixed Rear Panel - High pressure laminate markerboard panel:
 - 1) Color: Selected by Architect.
- e. Inside Surface of Doors - Same as fixed rear panel.
- f. Inside Surface of Doors - Tackboard panel consisting of polyester fabric facing on core:
 - 1) Color: Selected by Architect.
- g. Projection Screen - Pull down, matte, white projection screen, not less than 8 inches (200 mm) smaller in each direction than overall cabinet size, and mounted above rear visual display panel.
- h. Fluorescent Light - Minimum 24 inches (610 mm) long, and mounted above rear visual display panel.
- i. Width - As indicated on Drawings.
- j. Height - As indicated on Drawings.
- k. Accessories - Cylinder lock and flip chart pad clamp.

2.7 FINISH REQUIREMENTS

- A. Comply with NAAMM *Metal Finishes Manual for Architectural and Metal Products* for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Aluminum Finishes:
 1. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
 2. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
 3. Baked Enamel or Powder Coat Finish: AAMA 2603, except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements:
 1. Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication:
 - a. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

3.2 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the work.
- B. Examine roughing in for electrical power systems to verify actual locations of connections before installation of motorized, sliding visual display units.
- C. Examine walls and partitions for proper preparation and backing for visual display units.
- D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- E. Proceed with installation after correcting unsatisfactory conditions.

3.3 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation. Clean substrates of substances, such as dirt, mold, and mildew, that impair the performance of and affect the smooth, finished surfaces of visual display boards.
- B. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces:
 - 1. Moisture Content: Maximum of 4 percent when tested with an electronic moisture meter.
 - 2. Prepare substrates indicated to receive glass writing surfaces required by manufacturer's written instructions to achieve a smooth, dry, clean, structurally sound surface that is uniform in color:
 - a. Gypsum Board: Prime gypsum board with primer as recommended in writing by primer/sealer manufacturer and glass writing surface manufacturer.
 - b. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- C. Prime wall surfaces indicated to receive visual display units, direct applied floor to ceiling visual display assemblies and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.
- D. Prepare recesses for sliding visual display units as required by type and size of unit.

3.4 INSTALLATION

- A. Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Field Assembled Visual Display Board Assemblies:
 - 1. Coordinate field assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit:
 - a. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
 - b. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support

- accessories to suit conditions indicated.
- c. Field Applied Aluminum Trim: Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at maximum 24 inches (610 mm) o.c.
- C. Factory Fabricated Visual Display Board Assemblies:
1. Adhere to wall surfaces with egg size adhesive gobs at 16 inches (400 mm) o.c., horizontally and vertically:
 - a. Field Applied Aluminum Trim - Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at maximum 24 inches (610 mm) o.c.
 - b. Mounting - Height Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated:
 - 1) Mounting Height for Grades K through 3: 24 inches (610 mm) above finished floor to top of chalktray.
 - 2) Mounting Height for Grades 4 through 6: 28 inches (711 mm) above finished floor to top of chalktray.
 - 3) Mounting Height for Grades 7 and Higher: 36 inches (914 mm) above finished floor to top of chalktray.
- D. Factory Fabricated Visual Display Board Assemblies:
1. Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches (400 mm) o.c. Secure tops and bottoms of boards to walls:
 - a. Field Applied Aluminum Trim - Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at maximum 24 inches (610 mm) o.c.
 - b. Mounting Height - Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated:
 - 1) Mounting Height for Grades K through 3: 24 inches (610 mm) above finished floor to top of chalktray.
 - 2) Mounting Height for Grades 4 through 6: 28 inches (711 mm) above finished floor to top of chalktray.
 - 3) Mounting Height for Grades 7 and Higher: 36 inches (914 mm) above finished floor to top of chalktray.
- E. Natural Slate Chalkboards:
1. Align and level joints between adjoining panels, and apply manufacturer's recommended joint filler compound. Hone and finish joints to continuous even plane:
 - a. Field Applied Aluminum Trim - Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at maximum 24 inches (610 mm) o.c.
 - b. Mounting Height - Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated:
 - 1) Mounting Height for Grades K through 3: 24 inches (610 mm) above finished floor to top of chalktray.
 - 2) Mounting Height for Grades 4 through 6: 28 inches (711 mm) above finished floor to top of chalktray.
 - 3) Mounting Height for Grades 7 and Higher: 36 inches (914 mm) above finished floor to top of chalktray.
- F. Display Rails:
1. Install rails at mounting heights indicated on Drawings, or if not indicated, at height indicated below. Attach to wall surface with fasteners at not more than 16 inches (400 mm) o.c.:
 - a. Mounting Height: 72 inches (1829 mm) above finished floor to top of rail.

- G. Floor to Ceiling Markerboard Panels:
 - 1. Attach panels to wall surface with egg size adhesive gobs at 16 inches (400 mm) o.c., horizontally and vertically:
 - a. Join adjacent panels with concealed steel splines for smooth alignment.
 - b. Join adjacent panels with exposed, H shaped aluminum trim painted to match wall panel.

- H. Floor to Ceiling Tackboard Panels:
 - 1. Attach panels to wall surface with egg size adhesive gobs at 16 inches (400 mm) o.c., horizontally and vertically:
 - a. Install wrapped edge panels with butt joints between adjacent wall panels.
 - b. Join adjacent panels with exposed, H shaped aluminum trim covered with same fabric as wall panels.

- I. Rail Support System:
 - 1. Install horizontal support rail at mounting heights indicated on Drawings. Attach to wall with fasteners at 12 inches (300 mm) o.c.:
 - a. Mounting Height: 72 inches (1829 mm) above finished floor to top of rail.
 - b. Hang visual display units on rail support system.

- J. Modular Support System:
 - 1. Install adjustable standards at mounting heights indicated on Drawings. Install standards at 48 inches (1200 mm) o.c., vertically aligned and plumb, and attached to wall with fasteners at 12 inches (300 mm) o.c.:
 - a. Mounting Height: 12 inches (305 mm) above finished floor to bottom of standard.
 - b. Install single slotted standard at each end of each run of standards and double slotted standards at intermediate locations.
 - c. Provide locking screw at top corner of visual display board at each standard.
 - d. Hang visual display units on modular support system.

- K. Sliding Visual Display Units:
 - 1. Install units at mounting heights indicated. Attach to wall framing with fasteners at not more than 16 inches (400 mm) o.c.:
 - a. Adjust panels to operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

- L. Visual Display Conference Units:
 - 1. Install units at mounting heights indicated on Drawings. Attach to wall surface with concealed brackets screwed to wall:
 - a. Mounting Height: 72 inches (1829 mm) above finished floor to top of cabinet.

3.5 CLEANING AND PROTECTION

- A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.

- B. Touch up factory applied finishes to restore damaged or soiled areas.

- C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 10 11 00

SECTION 10 14 00 – SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 - 1. Room identification signs.
 - 2. Restroom signs and symbols
 - 3. Misc. identification signs
 - 4. Informational signs (not identification signs), including ALS.
 - 5. Accessories necessary for a complete installation.

1.3 RELATED SECTIONS

- A. Section 05 40 00: Cold-Formed Steel Framing.
- B. Sections 08 Series: Doors.
- C. Section 09 21 16: Gypsum Board Assemblies.
- D. Section 09 30 00: Tiling.
- E. Section 10 28 13: Toilet Accessories.

1.4 SUBMITTALS

- A. Product Data: Technical data for each type of signage.
- B. Shop Drawings: Submit fabrication and installation details and attachments to other work.
 - 1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 2. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
 - 3. Diagrams of each type and size of sign.
- C. Samples: Submit one sample of each specified sign type, full-sized.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Accessibility Requirements: Comply with applicable requirements.
 - a. Americans with Disabilities Act of 1990, as amended.
 - 1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design.

- b. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA).
 - 1) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
 - 2) CBC Section 11B-703.2 to 703.8. Signage.
 - 2. CFC – 2022 California Fire Code.
 - 3. California Code of Regulations (CCR)
 - a. CCR 19-3 - Title 19, Chapter 3.
 - 4. Fed.Stnd - Federal Standard
 - a. Fed.Stnd 595C, Colors Used in Federal Procurement.
- B. Thermal Movements: For exterior fabricated channel dimensional characters, allow for thermal movements from ambient and surface temperature changes.
- 1. Temperature Change: 120 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C), material surfaces.
- C. Inspection: Tactile signs shall be field inspected for compliance after installation (11B-703.1.1.2).

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.
- B. Lettering: Protect Architectural from public, including but not limited to, students.

1.7 WARRANTY

- A. Written warranty signed by manufacturer in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. A Good Sign.
 - 2. ASI Modulex, Inc.
 - 3. Gemini.
 - 4. Mohawk Sign Systems.
 - 5. Vomar Products, Inc.
 - 6. Western Highway Products.
 - 7. Or approved equal.
- B. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.

- C. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- D. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- E. Acrylic Sheet: ASTM D 4802, category standard with manufacturer for each sign, Type UVF (UV filtering).
- F. Plastic Laminate Sheet: NEMA LD 3, general purpose HGS grade, 0.048-inch (1.2-mm) nominal thickness.
- G. Vinyl Film: UV resistant vinyl film of nominal thickness indicated, with pressure sensitive, permanent adhesive on back; die cut to form characters or images indicated and suitable for exterior applications.
- H. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.
- I. Accessories:
 - 1. Fasteners and Anchors: As necessary for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - a. Use concealed fasteners and anchors unless indicated to be exposed.
Exposed Metal Fastener Components: Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - 2. Adhesive: Recommended by sign manufacturer.
 - 3. Bituminous Paint: Cold applied asphalt emulsion complying with ASTM D 1187.

2.2 SIGNAGE

- A. Solid Plastic Tactile Room, Restroom and Miscellaneous Identification Signs: 1/4-inch thick, Graphic Process Sand Carved with pre-drilled holes for mounting screws.
 - 1. Sign Panel Perimeter:
 - a. Edge Condition: Square cut.
 - b. Corner Condition in Elevation: 1/4" radius.
 - 2. Mounting at Walls: Stainless steel vandal-proof pin-in-head torx screws
 - 3. Mounting at Door Faces: Clear silicone adhesive
 - 4. Mounting at Glazing: Clear silicone adhesive
 - 5. Text and Typeface: Accessible raised characters and Braille. Finish raised characters to contrast with background color, and finish Braille to match background color.
 - a. Raised Characters: Refer to drawings.
 - b. California Contracted Grade 2 Braille: Refer to drawings.
 - c. Pictograms: Field height of minimum 6 inches; no characters or braille in pictogram field; nonglare, field contrast to pictogram, text descriptors below pictogram field.
 - d. Accessibility Symbols: Where used, symbols shall comply with CBC 11B-703.7.
 - 6. Color: As selected by Architect from manufacture's full range of standard colors.
 - 7. For exterior uses, fabricate signs from exterior grade materials with UV inhibitor.
 - 8. Sign Types:
 - a. Office and Classroom
 - 1) Basis of Design: Mohawk M-310-A; M-310-B
 - b. Rooms with permanent room name and no room number (i.e. "storage", "custodian", "electrical", etc.)
 - 1) Basis of Design: Mohawk M-1000

- 2) Size: 4" x 10"
- c. Restroom Signs and symbols: Refer to drawings.
- d. Assistive Listening System Signs: Refer to drawings.

2.3 FABRICATION

- A. Provide sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners.

2.4 FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.
- D. Aluminum Finishes:
 - 1. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.
 - 2. Baked Enamel or Powder Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of signage work. Verify sign support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- B. Proceed with installation after correcting unsatisfactory conditions.

3.2 INSTALLATION

- A. Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent

walls. Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door.

- a. See drawings for the mounting height and location of each sign.
 4. Before installation, verify sign surfaces are clean and free of materials or debris that impair installation.
 5. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
1. Exposed Fastener: Install vandal-resistant fastener; set screw head flush with sign face
- C. Signs Mounted on Glass: Provide 1/8 inch thick solid plastic sign blank matching sign material, finish, and size onto opposite side of glass to conceal back of sign.
- D. DSA Inspections: Signs and identifications or other information shall be field inspected after installation and approved by Division of the State Architect prior to the issuance of a final certificate of occupancy, or final approval where no certificate of occupancy is issued. The inspection shall include, but not limited to, verification that Braille dots and cells are properly spaced and the size, proportion and type of raised characters are in compliance with CBC, Section 11B-703.1.1.2.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 00

SECTION 10 28 13 - TOILET 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: Requirements including but not limited to:
 - 1. Public use washroom accessories.
 - 2. Public use shower room accessories.
 - 3. Private use bathroom accessories.
 - 4. Electric hand dryers.
 - 5. Underlavatory guards.
 - 6. Custodial accessories.
 - 7. Accessories necessary for a complete installation.

1.3 SUBMITTALS

- A. Product Data: Technical Data including construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 1. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 2. Include electrical characteristics.
- B. Samples: Full size, for each exposed product and for each finish specified.
 - 1. Approved full size Samples will be returned and may be used in the Work.
- C. Product Schedule: Show types, quantities, sizes, and installation locations by room of each accessory required. Identify locations using room designations indicated.
- D. Maintenance Data: Submit for inclusion in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Accessibility Requirements: Comply with applicable requirements.
 - 1. Americans with Disabilities Act of 1990, as amended.
 - a) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design.
 - 2. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA).
 - a) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Source Limitations: Obtain products from single source from single manufacturer.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

- A. Mirrors: Written warranty signed by manufacturer in which manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: 15 years from date of Substantial Completion.
- B. Electric Hand Dryers: Written warranty signed by manufacturer in which manufacturer agrees to repair or replace hand dryers that fail within specified warranty period.
 - 1. Failures include, motors and/or sensors which fail to activate when properly energized.
 - 2. Warranty Period: 5 years from date of substantial completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers: Toilet accessories schedule is based on Bobrick Washroom Equipment. Subject to compliance with requirements, provide products by one of the following:
 - 1. Bobrick Washroom Equipment, Inc.
 - 2. Bradley Corporation.
 - 3. Or approved equal.
- B. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- C. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- D. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- E. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot dip zinc coating.
- F. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot dip galvanized after fabrication.
- G. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear glass mirrors, nominal 6.0 mm thick.

2.2 COMPONENTS

- A. Underlavatory Guard: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with piping and/or burns from piping; allow service access without removing coverings.
 - 1. Product: Truebro LavShield Protective Lavatory Enclosure
 - 2. Material and Finish: Antimicrobial, molded plastic, white.
 - 3. Provide at all lavatories

2.3 FABRICATION

- A. Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items. Remove temporary labels and protective coatings. Clean and polish exposed surfaces according to manufacturer's written recommendations.

PART 4 - SCHEDULE

4.1 ACCESSORY SCHEDULE

- A. TA-1 - Soap Dispensers:
 - 1. Mounting: Surface.
 - 2. Model No.: DEB ProLine #98123.
 - 3. Locations: Refer to drawings.
 - 4. Owner Furnished, Contractor Installed.
- B. TA-2 - Mirrors:
 - 1. Mounting: Surface.
 - 2. Model No.: B-290 at staff toilet rooms; B-1556 at student toilet rooms.
 - 3. Size: 24 inches by 36 inches (600 mm by 900 mm), unless shown otherwise.
 - 4. Locations: Refer to drawings.

- C. TA-3 - Toilet Paper Dispensers (At Typical Non-accessible Toilet Stalls):
 - 1. Mounting: Surface.
 - 2. Model No.: GP PRO, SOFPUL 56501.
 - 3. Locations: Non-accessible water closets and toilet stalls.
 - 4. Owner Furnished, Contractor Installed.

- D. TA-4 - Paper Towel Dispensers: (Low Profile)
 - 1. Mounting: Surface (Less than 4" projection)
 - 2. Model No.: B-262.
 - 3. Locations: Staff toilet rooms.

- E. TA-5 - Grab Bars: (At Typical Accessible Toilet Stalls)
 - 1. Size/Finish: Continuous 42" x 54" x 1-1/2 inch diameter satin stainless steel
 - 2. Clearance: 1-1/2 inch between rail and wall.
 - 3. Model No.: B-6897.
 - 4. Mounting: Attach with concealed mounting kit. Mount parallel to floor.
 - 5. Location: Accessible water closets and toilet stalls.

- F. TA-6 - Sanitary Napkin Dispensers:
 - 1. Mounting: Surface.
 - 2. Model No.: Evogen EV1SS-Free
 - 3. Operation: Push button.
 - 4. Capacity: 14 Napkins/ 22 Tampons.
 - 5. Locations: Indicated on Drawings.
 - 6. Owner Furnished, Contractor Installed.

- G. TA-7 - Sanitary Napkin Disposal:
 - 1. Mounting: Surface.
 - 2. Model No.: Waxie 820750.
 - 3. Locations: Women's non-accessible toilet stalls.

- H. TA-8 Mop and Broom Holder:
 - 1. Mounting: Surface.
 - 2. Model No.: B-239 x 34.
 - 3. Capacity: Four hooks, three mop holders.
 - 4. Locations: Mop sink at each custodial rooms.

- I. TA-9 – Not Used

- J. TA-10 – Not Used

- K. TA-11 – Not Used

- L. TA-12 – Not Used

- M. TA-13 - Electric Hand Dryers:
 - 1. Mounting: Semirecessed, maximum 3-9/16 inch recess.
 - 2. Model No.: World Dryer, Slim Dri #L-974
 - 3. Voltage: 120 volt, single phase.
 - 4. Set "Heating Control" to "Off".
 - 5. Location: Refer to drawings.

- N. TA-14 – Not Used

- O. TA-15 - Grab Bars: (At Typical Semi-ambulatory Toilet Stalls)
 - 1. Size/Finish: 42" x 1-1/2 inch diameter satin stainless steel
 - 2. Clearance: 1-1/2 inch between rail and wall.
 - 3. Model No.: B-6806-42.
 - 4. Mounting: Attach with concealed mounting kit. Mount parallel to floor.
 - 5. Location: Semi-ambulatory toilet stalls.

- P. TA-17 - Trash Receptacle
 - 1. Mounting: Recessed
 - 2. Model No.: B3644.
 - 3. Locations: Refer to drawings.

- Q. TA-18 - Toilet Paper Dispensers:
 - 1. Mounting: Semi-recessed (Less than 4" projection).
 - 2. Model No.: B-3888.
 - 3. Location: Accessible water closets and toilet stalls.

- R. TA-19 - Seat Cover Dispenser:
 - 1. Mounting: Surface.
 - 2. Model No.: B-221
 - 3. Location: All water closets and toilet stalls.

- S. TA-20 - Sanitary Napkin Disposal:
 - 1. Mounting: Recessed.
 - 2. Model No.: B-353.
 - 3. Locations: Women's accessible toilet stalls.

- T. TA-21 – Grab Bars: (At Drinking Fountains)
 - 1. Style/finish: 1-1/2 inch diameter satin stainless steel.
 - 2. Model No: Bobrick 819298.
 - 3. Mounting: Attached with concealed mounting kit.
 - 4. Location: Drinking fountains without alcove.

- U. TA-22 – Paper Towel Dispensers:
 - 1. Mounting: Surface
 - 2. Model No.: B-263
 - 3. Location: Kitchen Toilet Room

- V. TA-23 – Trash Receptacle:
 - 1. Mounting: Surface
 - 2. Model No.: B-277
 - 3. Location: Kitchen Toilet Room

END OF SECTION 10 28 13

SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 - 1. Fire extinguisher.
 - 2. Extinguisher cabinet.
 - 3. Brackets.
 - 4. Accessories necessary for a complete installation.

1.3 SUBMITTALS

- A. Product Data: Submit product data including construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection specialties.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Cabinets: Include roughing in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, panel style.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10 *Standard for Portable Fire Extinguishers*.
 - 2. Fire Extinguisher Listing: UL listed with UL Listing Mark for type, rating, and classification of extinguisher.
 - 3. Accessibility Requirements: Comply with applicable requirements.
 - a. Americans with Disabilities Act of 1990, as amended.
 - 1) ADA Title II Regulations & the 2010 ADA Standards for Accessible Design.
 - b. CBC 2022 California Building Code (CCR Title 24, Part 2, as adopted and amended by DSA).
 - 1) CBC Chapter 11B, Access to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
 - 2) CBC section 11B-307, 11B-308, 11B-309 and 11B-403.
- B. Source Limitations: Obtain fire extinguishers and fire protection cabinets through one source from a single manufacturer.

1.5 COORDINATION

- A. Coordinate size of fire extinguisher cabinets to ensure that type and capacity of fire extinguishers indicated and required by the Fire Marshall are accommodated.

1.6 WARRANTY

- A. Warranty: Written warranty in which manufacturer agrees to repair or replace components of portable fire extinguishers failing in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: 6 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Basis of Design: Specifications are based on the Potter Roemer Alta Series fire extinguisher cabinets. Subject to compliance with requirements, provide comparable products by one of the following:
 - 1. J. L. Industries, Inc.
 - 2. Larsen's Manufacturing Company.
 - 3. Potter Roemer LLC.

2.2 COMPONENTS

- A. Fire Extinguisher: Provide fire extinguishers for each fire extinguisher cabinet and at locations indicated. Provide multipurpose dry chemical units, UL1 rated 4-A:20-B:C, 10 lb (4.5-kg) nominal capacity, in enameled steel container. Provide mounting brackets where necessary.
- B. Cabinets: Fire rated cabinet sized for housing fire extinguishers of types and capacities indicated or required by AHJ.
 - 1. Cabinet Construction: Construct fire rated cabinets with double walls fabricated from 1.1mm thick, cold rolled steel sheet lined with minimum 16 mm thick, fire barrier material. Provide factory drilled mounting holes.
 - a. Cabinet Metal: Steel sheet.
 - b. Cabinet Mounting: Semi-recessed.
 - c. Cabinet Trim Style: Semi-recessed.
 - d. Cabinet Trim Material: Steel sheet.
 - e. Color: White
 - f. Door Material: Tempered glass
 - g. Door Style: Duo vertical door panel with lock. Vertical red lettering to read: "Fire Extinguisher".
 - h. Door Construction: Fabricate doors of materials indicated and coordinated with cabinet types and trim styles selected.
 - i. Door Hardware: Door operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide projecting lever handle with cam action latch with lock. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
 - 2. Semi-recessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation. Square edge trim, 32 mm to 38 mm backbend depth. Cabinet shall have a 4" max projection from the face of wall.

- C. Accessories:
 - 1. Mounting Bracket: Steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked enamel finish.

2.3 FABRICATION

- A. Fire Protection Cabinets: Standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Provide factory drilled mounting holes. Prepare doors and frames to receive locks.
- B. Cabinet Doors: Fabricate doors from materials indicated and coordinated with cabinet types and trim styles selected.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 FINISH

- A. Apply finishes in factory after products are assembled. Protect cabinets with plastic or paper covering, prior to shipment.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare recesses for recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.2 INSTALLATION

- A. Comply with manufacturer's printed instructions for installation.
- B. Install fire protection specialties in locations and at mounting heights indicated compliant with accessibility requirements acceptable to authorities having jurisdiction. Fasten cabinets to structure, square and plumb.
- C. Fire Protection Cabinets:
 - 1. Unless otherwise indicated, provide semi-recessed fire protection cabinets.
 - 2. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

3.3 ADJUSTING AND CLEANING

- A. Adjust cabinet doors to operate freely without binding.
- B. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory finished appearance. Use materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

- E. Replace fire protection cabinets damaged or deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 00

SECTION 12 36 63 – EPOXY RESIN COUNTERTOPS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Epoxy resin work surfaces
 - 2. Accessory items as specified herein

1.3 DEFINITIONS

- A. Comparable Product: Product demonstrated and approved through submittal process, or where indicated as a produce substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

1.4 SUBMITTALS

- A. Manufacturer's Compliance Statement:
 - 1. Pre-qualified manufacturers whose name appears below under acceptable Manufacturers shall provide statement of compliance as scheduled by General Contractor; or
 - 2. Manufacturers requesting substitution of products shall submit statement of compliance at proposal time in accordance with Division 1 requirements for substitutions.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
- C. Samples:
 - 1. Submit minimum 2 inches by 2 inches samples. Indicate full range of color and pattern variation for Architect's selection.
 - 2. Submit 12 inch long by 4 inches wide sample in color and pattern selected and approved by Architect. Approved sample will be retained as standards for work.
- D. Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project close-out documents.
- E. Product Samples to be submitted for approval (One (1) each):
 - 1. Worktop: Four (4) inch x four (4) inch sample of each material.

1.5 QUALITY ASSURANCE

- A. Allowable Tolerances:
 - 1. Variation in Component Size: Plus or minus 1/8 inch.
- B. Fabricator/Installer Qualifications: Approved by manufacturer of solid polymer manufacturer.

- C. Mock-Up(s):
 - 1. Prior to final approval of shop drawings, erect one full-size mock-up of each component at project site for Architect review.
 - 2. Rework or remake mock-up until accepted; remove rejected units from project site. Acceptable mock-ups shall remain as part of finished work.

1.6 PROJECT CONDITIONS

- A. Field measurements shall be taken to verify that the equipment will fit into the designated space. Entryways, corridors and door openings shall be verified to ensure that the equipment be manufactured in a manner to permit it to be moved through properly into place.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Schedule delivery so rooms are sufficiently complete that material can be installed immediately following delivery.
- B. Casework: Protect finished surfaces from soiling or damage during handling and installation.
- C. Work surfaces: Protect throughout the construction period.

1.8 WARRANTY

- A. Warrant the work specified herein for 15 years against becoming unserviceable or causing an objectionable appearance resulting from both defective or nonconforming materials or workmanship.
- B. Defects shall include, but not be limited to the following:
 - 1. Shrinking, warping, cracking, chipping, splitting, or deteriorating excessively.
 - 2. Becoming loose from substrate.
 - 3. Inadequate color depth.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Durcon, www.durcon.com
- B. Prime Industries, Inc., www.piilab.com
- C. Trespa North America, www.trespa.com
- D. Substitutions: Under Provisions of Section 01 25 13.

2.2.1 WORK SURFACES

- E. Epoxy Resin Tops: Factory molded tops of modified epoxy resin formulation, uniform mixture throughout full one (1) inch thickness. Color shall be non-glare black. Cast surfaces shall be very smooth, with factory cutouts for sinks and drip grooves. Plain butt type joints assembled with epoxy adhesive. Backsplash: Square butt, 4 inch height.

2.2 ACCESSORY PRODUCTS

- A. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, nonporous joints, with chemical bond.

- B. Sealant: Manufacturer's standard mildew-resistant, FDA/UL recognized silicone sealant in color-matching or clear formulations.
- C. Sink/bowl Hardware: Manufacturer's approved bowl clips, inserts and fasteners.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install components plumb and level, in accordance with approved shop drawings and product installation details.
- B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.

3.2 CLEANING AND PROTECTION

- A. Keep components and hands clean during installation. Remove adhesives, sealants, and other stains. Components shall be clean on Date of Substantial Completion.
- B. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired to architect's satisfaction and invoice for the cost of repairs; before repairs are made, cost estimates are subject to architect's approval.

3.3 MAINTENANCE INFORMATION

- A. Provide Care and Maintenance information to Owner upon completion of Project.
- B. Review maintenance procedures and warranty details with the Owner upon completion of project.

END OF SECTION 12 36 63

SECTION 22 00 00 - GENERAL PLUMBING PROVISIONS

PART 1 - GENERAL

1.01 GENERAL CONDITIONS:

- A. The foregoing General and Special Conditions shall form a part of this Division with the same force and effect as though repeated herein. The provisions of this Section shall apply to all the Sections of Division 22.

1.02 CODES AND REGULATIONS:

- A. All work and materials shall be in full 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 specifications shall govern. Applicable codes and regulations are:

1. California Code of Regulations – CCR:
 - a. Title 8, Industrial Relations.
 - b. Title 24, Building Standards.
2. California Building Code – CBC.
3. California Mechanical Code – CMC.
4. California Plumbing Code – CPC.
5. California Green Building Code.
6. American Gas Association – AGA.
7. American National Standards Institute – ANSI.
8. American Society of Heating, Refrigerating and Air Conditioning Engineers – ASHRAE.
9. American Society of Mechanical Engineers – ASME.
10. American Society for Testing and Materials – ASTM.
11. American Water Works Association – AWWA.
12. Cast Iron Soil Pipe Institute – CISPI.
13. California Electrical Code – CEC.
14. National Electrical Manufacturers Association – NEMA.
15. National Fire Protection Association – NFPA.
16. National Sanitation Foundation – NSF.
17. Plumbing and Drainage Institute – PDI.
18. Sheet Metal and Air Conditioning Contractors National Association – SMACNA.
19. Underwriters' Laboratory – UL.
20. Occupational Safety and Health Act - OSHA.
21. California Assembly Bill 1953 (AB1953).

1.03 PERMITS AND FEES:

- A. The Contractor shall take out all permits and arrange for all tests in connection with his work as required by local ordinances. All charges are to be included in the work. Permits for equipment connected to a particular system are to be considered as a part of the work included under each system; for example, permits for electric motor connection are part of electrical work, permits for domestic water or gas connections are part of plumbing work. All charges for service connections, meters, etc. by utility companies or districts shall be included in the work.

1.04 COORDINATION OF WORK:

- A. Layout of materials, equipment and systems is generally diagrammatic unless specifically dimensioned. The actual locations of all materials, piping, fixtures, equipment, supports, etc. shall be carefully planned, prior to installation of any work, to avoid all interference's with each other, or with structural, electrical or architectural elements. Verify the proper voltage and phase of all equipment with the electrical plans. All conflicts shall be called to the attention of the Engineer prior to the installation of any work or the ordering of any equipment.

1.05 GUARANTEE:

- A. Guarantee shall be in accordance with the General Conditions. These specifications may extend the period of the guarantee for certain items. Where such extensions are called for, or where items are normally provided with guarantee periods in excess of that called for in the General Conditions, the Certificate of Guarantee shall be furnished to the Owner through the Engineer.

1.06 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.

1.07 SUBMITTALS:

- A. Submit shop drawings in accordance with Division 01.
- B. 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 and equipment shall not be ordered or installed until written review is processed by the Engineer. Any item omitted from the submittal shall be provided as specified without substitution. All shop drawings must comply with the following:
 - 1. Shop drawings are required for all material and equipment items and shall include manufacturer's name and catalog numbers, dimensions, capacities, performance curves, and all other characteristics and accessories as listed in the specifications or on the drawings. Descriptive literature shall be current factory brochures and submittal sheets. Capacities shall be certified by the factory.
 - 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 marked with the specification paragraph number for which they are proposed. All equipment shall also be identified by the mark number as indicated on the drawings.
 - 3. All capacities, characteristics, and accessories called for in the specifications or on the drawings shall be highlighted, 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.

- C. Substitutions: Manufacturers and model numbers listed in the specifications or on the drawings represent the standard of quality and the features desired. Unless otherwise noted, alternate manufacturers may be submitted for review by the Engineer. Calculations and other detailed data indicating how the item was selected shall be included. The Contractor shall assume full responsibility that substituted items or procedures will meet the specifications and job requirements and shall be responsible for the cost of redesign and modifications to the work caused by these items.
- D. 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.

1.08 OPERATION AND MAINTENANCE INSTRUCTIONS:

- A. Submit one electronic pdf copy for review and after approved submit three hard copies of the Operation and Maintenance Instructions and Wiring Diagrams for all equipment and parts lists for all equipment, 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. WH-1). All wiring diagrams shall agree with revised 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. Water Heaters, Pumps, 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. **(These submittals shall be submitted with regular submittals at start of job so Commissioning Contractor can start on the commissioning check list for LEED Certification or Title 24 Requirements)**
- 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 instruction that applies to the control system. The Engineer's office shall be notified 96 hours prior to this meeting.
- C. Acknowledgment: The Contractor shall prepare a letter indicating that all operation and maintenance instructions (printed, verbal and posted) 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.

1.09 RECORD DRAWINGS:

- A. The Contractor shall maintain a set of prints for the project as a record of all construction changes 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. buildings, curbs and walks. In addition, the water, gas, sewer, etc. within the building shall be recorded by offset distances from building walls. The original drawings will be made available to the Contractor from which he shall have a set of reproducible drawings made.

The Contractor shall then transfer the changes, notations, etc. from the marked-up prints to the reproducible drawings. The record drawings (marked-up prints and reproducibles) shall be submitted to the Engineer for review (as an alternative, the marked-up prints may be photocopied full size on reproducible stock).

PART 2 - PRODUCTS

2.01 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. Manville Corporation. Protective coating shall be extended 6" above surrounding grade.

2.02 CONCRETE ANCHORS:

- A. Concrete Anchors shall comply with CBC 1901A.3. Steel stud with expansion anchor requiring a drilled hole; powder driven anchors are not acceptable. Minimum concrete embedment shall be 4-1/2 diameters. Minimum spacing shall be 10 diameters center-to-center and 5 diameters from center to edge of concrete. Maximum allowable stresses for tension and shear shall be 80% of the test report values "with special inspection". Anchors shall be Hilti, Philips - or Approved equal.

2.03 SEISMIC RESTRAINTS:

- A. All plumbing systems (all equipment, piping, etc.) shall be provided with seismic restraints in accordance with "Guidelines for Seismic Restraint of Mechanical Systems" dated 2006 by SMACNA.

2.04 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 preprinted markers or stenciled marking, and include arrows to show the direction of flow. 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 floor, walls or ceilings or otherwise pass into inaccessible spaces, and at 50' maximum intervals along exposed portion of lines. Marking of short branches and repetitive branches for equipment connections is not required.
- B. 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. WH-1). Provide 1/2" high lettering, white on black background. Nameplates shall be permanently secured to the unit.
- C. Valves: Provide valve tags 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. Provide brass tags or plastic laminate tags. Prepare and submit a tagged valve schedule, listing each valve by tag number, location and piping service. Mount in glazed frame where directed.

2.05 EQUIPMENT SUPPORT FRAMES:

- A. Unless specifically noted otherwise, it shall be the responsibility of Plumbing Contractor to furnish and install all support frames for its equipment.

PART 3 - EXECUTION

3.01 SCHEDULING OF WORK:

- A. All work shall be scheduled subject to the approval of the Engineer and Owner. No work shall interfere with the operation of the existing facilities on or adjacent to the site.

3.02 CONDUCT OF WORK:

- A. 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 Divisions engaged upon this project or to the Owner.
- B. Plumbing Contractor shall arrange for all cutting necessary for the proper installation of its work, providing all sleeves and chases necessary. Cutting shall not be done in such a manner to impair the strength of the structure. Any damage resulting from work shall be repaired by the Contractor at his expense to the satisfaction of the Engineer.
- C. Progressively, daily at the completion of each day's work, 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.
- D. **IAQ Management plan will be in effect for LEED Certification. Adhesives and mastic must comply with low VOC requirements and documentation (MSDS, etc.) shall be provided with submittals.**

3.03 EXCAVATION AND BACKFILL:

- A. Excavation: Trenches are to be excavated to grade and depth established by drawings. Unless otherwise noted, minimum earth cover above top of pipe shall be 24", not including base and paving in paved areas. Width of trenches at top of pipe shall be a minimum of 16" plus the outside diameter of the pipe. Provide all shoring required by site conditions. Barrel of pipe shall have uniform support on trench bottom, hand excavate additional depth at bells, hubs and fittings. Where over-excavation occurs, provide compacted selected backfill to pipe bottom. Where ground water is encountered, remove to keep excavation dry, using well points and pumps as required.
- B. Backfill:
 - 1. Around Pipe and to One Foot Above Pipe: Material shall be river run sand or native granular free flowing material, free of clay lumps, silt or vegetable matter and shall have 100% passing through the No. 4 sieve and a maximum of 3% passing through the No. 200 sieve. 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 to 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 approval by the Engineer.
 - 3. Remove all water sensitive settlement from trench backfill regardless of location and compaction requirements.
- C. Compaction: Compact to a density of 95% within building and 90% outside building. Demonstrate proper compaction by testing at one-half of the trench depth. Perform three tests per 100' of trench.

3.04 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. The actual openings and the required cutting and patching shall be provided. 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 also be provided. Cutting and 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.

3.05 MANUFACTURER'S RECOMMENDATIONS:

- A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of a 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.

3.06 QUIETNESS:

- A. Piping and equipment shall be arranged and supported so that vibration is a minimum and is not carried to the building structure or spaces.

3.07 DAMAGES BY LEAKS:

- A. The Contractor shall be responsible for damages to other work 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 to other work caused by disconnected pipes or fittings, and the overflow of equipment prior to completion of the work.

3.08 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.

*** END OF SECTION ***

SECTION 22 00 01 PLUMBING

PART 1 - GENERAL

1.01 GENERAL CONDITIONS:

- A. The foregoing Section 22 00 00, General Plumbing Provisions shall form a part of this specification.

1.02 SCOPE:

- A. Included: Perform all work necessary and required to complete construction as indicated. Such work includes the furnishings of all labor, materials and services necessary for a complete, lawful and operating plumbing system with all equipment as shown or noted on the drawings or as specified herein. The work includes, but is not necessarily limited to, the following:
 - 1. Sanitary sewer system.
 - 2. Domestic water system.
 - 3. Plumbing fixtures.
 - 4. Plumbing equipment.
 - 5. Condensate drains.
 - 6. Storm drain system.
 - 7. Gas piping.
- B. Work Specified Elsewhere:
 - 1. Line voltage power wiring (60 volts or greater), motor starters in motor control centers, and disconnect switches are included in the Electrical Division, unless otherwise noted.
 - 2. Access doors.
 - 3. Concrete and reinforcing steel.
 - 4. 23 00 01, Heating, Ventilating and Air Conditioning.

1.03 CODES AND STANDARDS:

- A. All pipe, pipe or plumbing fittings or fixture, solder, or flux shall be lead free that provides water for human consumption per California Assembly Bill 1953 (AB1953).
- B. See Section 22 00 00 for additional requirements.

1.04 SUBMITTALS:

- A. Provide product data for all materials per Division 01.

PART 2 - MATERIALS

2.01 PIPING MATERIALS:

- A. Sanitary Sewer:
 - 1. Soil, Waste and Vent Piping:
 - a. Inside Building and Within Five Feet of Building Walls: Standard weight coated cast iron pipe and fittings. Plain end with neoprene gasket and stainless steel retaining sleeve, CISPI 301, ASTM A888 hubless cast-iron, or hub end with rubber gasket, ASTM A74, ASTM C564. Size 2" and smaller above grade may be standard weight galvanized steel, ASTM A53, with coated cast iron recessed drainage fittings, ANSI B16.12. All cast iron pipe and couplings shall be American made and tested, no

imported pipe or coupling is acceptable. Use heavy-duty (4-Band) couplings for all soil and waste piping. Use standard (2-Band) couplings for all vent piping. Tyler Pipe, AB & I Foundry or Charlotte Pipe. Couplings shall be Tyler, Anaco, Ideal or Husky.

OR

- a. Inside Building and Within Five Feet of Building Walls: PVC-DWV sewer pipe with solvent weld, ASTM D2665. Schedule 40 wall thickness. Traps, sink outlets, cleanouts, etc., shall be same material. Traps shall have union connections.
 - i. Piping over food prep centers, food serving facilities, food storage areas and other critical areas shall be kept to a minimum and shall not be exposed.
 - b. Outside Building:
FOR STATE JOBS, DELETE PLASTIC PIPE FROM DRAINAGE SECTION PER AMENDMENT TO UPC, 701.1.
 - i. For domestic waste only: Polyvinyl chloride gravity sewer pipe with bell and rubber Z-gasket, ASTM D3034, SDR 35. Carlon, J.M.
 - ii. PVC-DWV sewer pipe with solvent weld, ASTM D2665. Schedule 40 wall thickness. Traps, sink outlets, cleanouts, etc., shall be same material. Traps shall have union connections.
 - iii. Where cover is less than 15", pipe shall be cast iron, same as for inside of building.
2. Acid Waste: Polypropylene pipe, vent, and mechanical compression joint and fittings, ASTM D2146(D), or thermally fused joints joined by the use of electrical resistance coils within fittings. Flame retardant in accordance with ASTM D635 and UL 94 for piping above grade. Schedule 40 wall thickness. Traps, sink outlets, cleanouts, etc., shall be same material. Traps shall have union connections. Lab Line/ Enfield, GSR Fuseal, Orion Blueline or Zurn.

OR

2. Acid Waste: PVC-DWV sewer pipe ASTM D2665 with solvent weld. Schedule 40 wall thickness. Traps, sink outlets, cleanouts, etc., shall be same material. Traps shall have union connections.
 3. Cleanouts: Floor cleanouts: Smith 4020 with nickel bronze top in finished areas; Smith 4220 in utility areas. Wall cleanouts: Smith 4530 with stainless steel cover and screw. Comparable models of Josam, Wade, Zurn or equal.
 4. Cleanout Box: Precast reinforced concrete. Cast iron lid marked for service. Christy or equal; F22 in foot traffic area; G5 in roadways.
- B. Storm Drain:
1. Piping:
 - a. Inside Building and Within Five Feet of Building walls: Same as Soil, Waste, and Vent Piping.
 - b. Outside Building:
 - i. 10" and Smaller: Standard strength non-reinforced concrete bell and spigot, ASTM C14, or Polyvinyl chloride gravity sewer pipe with bell and rubber Z-gasket, ASTM D3034, SDR 35. Carlon, J.M. Where cover is less than 15", same as for inside building.
 - ii. 12" and Larger: Reinforced concrete, Class III, 2000 D-load, ASTM C76.
 - iii. Fittings: Fittings and couplings shall be specifically designed for the type of pipe used. Fittings and couplings designed for perforated or under drain piping will not be allowed.

C. Water, and Gas:

1. Hot and Cold Water, Piping:
 - a. Inside Building: Type L hard temper seamless copper, ASTM B88. Wrought copper fittings ANSI B16.22. Vacuum pipe shall have long sweeping elbow fittings. 95/5 tin-silver soldered joints. Brazesafe, Silcan or equal brazing material.
 - b. Outside Building Below Grade: Same as Inside Building with protective coating on ferrous pipe or Schedule 40 PVC pipe thru 2", Class 315 2" thru 4".

2. Gas Piping:
 - a. Above Grade: Schedule 40 black steel pipe, ASTM A120. 150 psi black malleable iron screwed fittings, ANSI B16.3, ANSI B31.8. Galvanized pipe and fittings will not be allowed. Flexible connections shall be convoluted brass with dielectric couplings, AGA approved. Outside building flexible connections shall be convoluted stainless steel with dielectric couplings, AGA approved. Prime and paint all piping.
 - b. Outside Building – Below Grade: Same as Inside Building – Above Grade, with protective coating of ferrous pipe or medium density polyethylene (MDPE) PE2708 or PE2406 pipe manufactured in accordance with ASTM D2513 and IAPMO Standards.

D. Condensate Drain Piping: Same as cold water piping.

E.. Valves and Specialties:

1. Valves:
 - a. General: Manufacturer's model numbers are listed to complete description. Milwaukee, Kitz, Apollo, Nibco, Stockham or equal. All valves shall be full size of upstream piping. Ball valves shall be substituted for gate valves 2" and smaller. Butterfly valves shall be substituted for gate valves 2-1/2" and larger. C_v factors for ball valves shall not be less than equal size gate valves.
 - b. Gate Valve: 2" and smaller: All bronze, rising stem, union bonnet, wedge disk, 200 psi WOG. Milwaukee No. 1152. The material of the valve stem shall be limited to a maximum of six (6) percent zinc content. 2-1/2" and larger: Iron body, bronze mounted. Non-rising stem. Wedge disk. 200 psi WOG. Flanged or AWWA hub as applicable. Open/ closed indicator. Milwaukee No. F2882. Underground valves shall have square operating nut.
 - c. Check Valve: 2" and smaller: All bronze swing check, regrinding. 200 psi WOG. Milwaukee No. 509, 1509 or equal. 2-1/2" and larger: Non-slam type, 125 psi iron body wafer type with renewable seats and stainless steel spring. Milwaukee 1400 series or equal.
 - d. Plug Valve: Eccentric bronze plug. Nickel chromium alloy iron body. Bronze bushings. Buna-N O-rings. UL approved for gas distribution. 175 psi WOG. DeZurick Series 400 or equal.
 - e. Ball Valves: Two or three piece construction, forged bronze body, chrome plated brass ball, threaded ends, teflon seats, PTFE or reinforced teflon stem seals, lever handle. Underground valves shall have "T" handle. Provide one operating "T" extension handle for all underground valves. Milwaukee BA100/150, BA300/350, Nibco or equal.
 - f. Gas Valves: 2" and smaller, Milwaukee BB2-100; 2-1/2" and larger, Rockwell #142 or equal.
 - g. Valve Box: Precast reinforced concrete. Cast iron lid marked for service. Christy or equal; F22 in foot traffic areas: G5 in roadways.
 - h. Butterfly Valve: Iron Body, Aluminum bronze disk (connection to shaft shall not be by pins, screws or bolts). Ductile body PPS coated with EPPM coated ductile disc. O-ring seals. Resilient removable seat. 416 stainless steel two piece shaft. 6" and smaller valves shall have multi-position lever handle. Underground valves shall have square operating nut. Provide one operating "T" handle for underground valves. Provide 2" extension neck at insulated pipes. Milwaukee "C" series, Kitz or equal.
2. Miscellaneous Specialties:
 - a. 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.
 - b. Union: 2" and Smaller: AAR malleable iron, bronze to iron ground seat. 300 psi.
 - c. Dielectric Coupling: Insulating coupling rated for 250 psig. EPCO or equal.
 - d. Shock Absorbers: Sioux Chief "Hydra-Rester", Zurn "Shoktrol", PPP "SC Series" or equal.

G. Flue Piping:

1. Gas Flue Piping: Flue pipe shall be type as recommended by equipment manufacturer for which the pipe is connected to. UL listed. Metalbestos, Amerivent or equal.
2. Flue Cap: Designed to properly ventilate flue regardless of wind direction. Storm proof, bird proof. Metalbestos, Amerivent or equal.

H. Miscellaneous Piping Items:

1. Pipe Support:
 - a. Pipe Hanger: Adjustable split ring, swivel hanger and rod. Black malleable iron. Size and maximum load per manufacturer's recommendation. Felt lined, B-Line B3690F, Unistrut or equal.
 - b. Construction Channel: 12 gage 1-5/8" x 1-5/8" steel channel. Single or multiple section. Self-locking nuts and fittings. B-Line, Unistrut, Superstrut or equal.
2. Pipe Sleeves: 24 gage galvanized steel. Adjus-to-Crete #10 with #99 thimble for floors. #100 for walls.
3. Flashing: Vent flashing and flashing for piping through roof shall be prefabricated 24 gauge galvanized steel roof jacks with 8" square flange around pipe. For tile or other roofing systems where pliable flashing is required, flashing shall be lead. Seal with weatherproofing mastic.

2.02 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. Pipe Insulation: Elastomeric type, ASTM C534, with a thermal conductivity of 0.27 at 75°F when measured in accordance with ASTM C177 or ASTM C518.
 1. Wall thickness: 3/4 in.
 2. Adhesive: Conform to Manufacturer's recommendations.
- C. 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-sq. ft-degrees F, at a mean temperature of 50 degrees F. Perm rating 0.02, ASTM E96. Puncture rating 50 Beach units, ASTM D781. Provide 3" (min.) wide tape of same material as lap for butt joints. For hot water piping, thickness shall be 1" for pipe sizes less than 2", 1-1/2" thickness for pipe sizes 2" and larger. CSG Insulation Corp., Manville, Owens-Corning or equal.
- D. Fiberglass Blanket: Unfaced. Thermal conductivity shall not exceed 0.25 Btu-in/hr sq. ft-degrees F, at a mean temperature of 50 degrees F. 1-1/2" thickness. Manville, Owens-Corning or equal.
- E. PVC Jacket (for exposed pipes and fittings): Pre-molded polyvinyl chloride (PVC) jackets. Size to match application. Provide PVC vapor barrier, pressure-sealing tape by same manufacturer. Zeston or equal.

2.03 FIXTURES:

- A. General: This Division shall rough-in for and install all plumbing fixtures shown on drawings. All trim not concealed shall be brass with polished chromium plate finish unless otherwise noted. 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. Manufacturer's model numbers are listed to complete description. Water consumption quantities listed on schedule are maximum. Equivalent models of American Standard, Crane, Haws, Kohler, Eljer, Zurn or equal. For drainage fixtures, equivalent models of Josam, Smith, Wade, Zurn or equal.

1. Accessibility Notes:

- a) Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Section 11B-213.3.
 - b) Effective March 1, 2017m all single user toilet facilities shall be identified as Gender Neutral facilities by a door symbol that complies with CBC Sections 11B-216.8 and 11B-703.7.2.6.3. No pictogram, text or braille is required on the symbol. If tactile requirements of CBC Section 11B-703.
 - c) Accessible plumbing fixtures shall comply with all the requirements in CBC Division 6.
 - d) Clearance around accessible water closets and in toilet compartments shall be 60 inches minimum measured perpendicular from the side wall and 56 inches minimum measured perpendicular from the rear wall per CBC Section 11B-604.3.1.
 - e) Heights and location of all accessible fixtures shall be mounted according to CBC Section 11B-602 through 11B-612.
 - f) Accessible fixture controls shall comply with CBC Section 11B-602.3 for drinking fountains, 11B-604.6 for water closets, 11B-604.9.5 for children's water closets, 11B-605.4 for urinals, 11B-606.4 for lavatories and sinks, 11B-607.5 for bathtubs, 11B-608.5 for showers, and 11B-611.3 for washing machines and clothes dryers.
 - g) Accessible lavatories and sinks shall be mounted with the front of the higher of the rim or counter surface 34" maximum above the finish floor or ground. Depth of lavatories or sinks shall not interfere with knee and toe clearance provided in accordance with CBC Section 11B-306 when a forward approach is required. CBC Section 606.3 and 11B-606.7.
 - h) Water supply and drainpipes under accessible lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under accessible lavatories and sinks. CBC Section 11B-606.5.
2. Cal Green Notes, Non-Residential Water Conserving Plumbing Fixtures and Fittings, CCR Title 24, Part 11, Section 5.303.3:
- a) For occupancies within the authority of the California Building Standards Commission as specified in Section 103, the provisions of Sections 5.303.3 and 5.303.4 shall apply to new fixtures in additions or areas of alteration to the building.
 - b) Standards for plumbing fixtures and fittings: Plumbing fixture and fittings shall be installed in accordance with the California Plumbing Code, and shall meet the applicable standards references in Table 1701.1 of the California Plumbing Code and in Chapter 6 of this code.
 - c) Water Closets: effective flush volume shall not exceed 1.28 gallons per flush.
 - d) Urinals: effective flush volume of wall-mounted shall not exceed 0.125 gallons per flush.

e) Showerheads:

- 1) Single showerhead: shall have a maximum flow rate of not more than 1.8 gallons per minute at 80 psi.
- 2) Multiple showerheads: when a shower is served by more than one showerhead, the combined flow rate of all showerheads and/or other shower outlets controlled by a single valve shall not exceed 1.8 gallons per minute at 80 psi, or the shower shall be designed to allow only one shower outlet to be in operation at a time.

f) Faucets and fountains:

- 1) Lavatories: faucets shall have a maximum flow rate of not more than 0.5 gallons per minute at 60 psi.
- 2) Kitchen: faucets shall have a maximum flow rate of not more than 1.8 gallons per minute at 60 psi. Kitchen faucets may temporarily increase the flow above the maximum rate, but not to exceed 2.2 gallons per minute at 60 psi, and must default to a maximum flow rate of 1.8 gallons per minute at 60 psi.
- 3) Wash fountains shall have a maximum flow rate of not more than 1.8 gallons per minute/20 [rim space (inches) at 60 psi].
- 4) Metering faucets shall not deliver more than 0.20 gallons per cycle / 20 [rim space (inches) at 60 psi].
- 5) Where complying faucets are unavailable, aerators or other means may be used to achieve reduction.

g) Commercial kitchen equipment:

- 1) Food waste disposers shall either modulate the use of water to no more than 1 gpm when the disposer is not in use (not actively grinding food waste/no-load) or shall automatically shut off after no more than 10 minutes of inactivity. Disposers shall use no more than 8 gpm of water.

h) Cal-Green section 5.303.4.1 code section does not affect local jurisdiction authority to prohibit or require disposer installation.

C. Stops and P-traps: All fixtures shall be provided with stops and p-traps as applicable.

1. Stops: All hot and cold water supplies shall be 1/2" angle stops with IPS inlets and compression outlets, stuffing box, screw driver lock shield, and 1/2" flexible brass tubing riser. Speedway. Wall mounted trim shall have concealed loose key wall stop. Chicago 1771 or equal.
2. P-traps: Brass, ground joint. 17 gage. American Standard, California Tubuler or equal.
 - a. Trap primers shall be provided with ball valve and cylinder key-lock access panel for all floor drains and floor sinks. PPP, Inc. or equal.

2.04 EQUIPMENT:

A. General Requirements:

1. General: These equipment specifications are to supplement the drawings. Refer to schedules on drawings for the specific equipment to be provided. Capacities shall be in accordance with the schedules shown on the drawings. Capacities are to be considered minimum.
2. Dimensions: Equipment must conform to space requirements and limitations as indicated on the drawings and as required for operation and maintenance. Equipment will not be accepted that does not readily conform to space conditions.
3. Ratings: Electrical equipment shall be in accordance with NEMA Standards and UL listed where applicable standards have been established.
4. Basis of Design: Manufacturers and model numbers listed in schedules as the basis of design are intended to represent the standard of quality and the features desired.
5. 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.
6. 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 not included in equipment package. Manual and magnetic starters shall have ambient compensating running over-current protection in all ungrounded conductors. Magnetic starters shall be manual reset. Controllers and other devices shall be in NEMA 3 or 12 enclosures as applicable.
 - b. Wiring: Conductors, conduit, and wiring shall be in accordance with Electrical Specifications. Individual items within assembly shall be separately protected with dead front, fused disconnect, fuse block, or circuit breaker for each ungrounded conductor, all accessible on operating side of equipment. Switches, contacts and other devices shall be in ungrounded conductors.
 - c. Motors: Shall be rated, constructed and applied in accordance with NEMA and ANSI Standards without using service factor. Single-phase motor shall be of type to suit application. Three-phase motors shall be open drip-proof, NEMA B design on pumps and fans, NEMA C on reciprocating equipment, sealed ball bearing, three-phase induction. Design shall limit starting inrush current and running current to values shown on drawings.
 - d. Starters: Motor starters shall be provided for all equipment except where starter is in a motor control center as designated on the electrical drawings.
 - e. Control Voltage: Equipment connected to greater than 240 volts shall be provided with 120 volt transformer if separate source is not indicated on plans. 240 volt control is acceptable if confined within control panel.
 - f. Submittals: Included in shop drawings shall be internal wiring diagrams and manufacturer's recommended external wiring.

- B. Electric Drinking Fountain: Wall hung, Dual height with Bottle Filler. Provide steel mounting brackets. Stainless steel basin. Removable grid drain. Chrome plated brass bubbler with automatic flow regulator and self-closing valve. Nonferrous evaporator. Hermetic compressor with automatic reset overload protection. Air cooled condenser. Adjustable thermostat. UL listed. ARI certified. Oasis, Sunroc.

- C. Water Heater, Gas: Glass lined tank. 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. AGA and CEC approved. Extended warranty for a period of 5 years minimum. State, A.O. Smith, National , Rheem or equal.
- D. Water Heater, Instantaneous Gas: 150 psi working pressure. Automatic temperature control. High limit control. Direct vent sealed combustion with category III stainless steel venting. Coated copper heat exchanger. Provide with remote control panel. AGA and CEC approved. Extended warranty period of 5 years minimum. Nortiz, Rheem, Takagi or equal.
- E. Water Heater, Electric: Glass lined tank. 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 and CEC approved. Extended warranty for a period of 3 years minimum. State, A.O. Smith, National, Rheem or equal.
- F. Water Heater, Instantaneous Electric: Tankless, automatic temperature control. High limit control. Provide microprocessor controls. UL listed and CEC approved. Warranty for a period of 1-year minimum. Rheem, Chronomite, Eemax or approved equal.
- G. Sewage Pumps:
 - 1. General: Furnish all labor, materials, equipment and incidentals required to provide duplex pumping system as specified herein. The system shall be by the same manufacturer as supplying the pump and motor control panel. Hydro-pneumatic Pumps or equal.
 - 2. System shall consist of sewage grinder pumps with explosion proof motors, level control switches, discharge plumbing with hydraulically sealed discharge flange, pump mounting plates with bottom rail supports, upper rail supports, lifting chain, pedestal mount and cord sealing plate for panel or NEMA 4 junction box; to be installed in factory fabricated fiberglass basin with cover. A NEMA 4X weatherproof control box shall be supplied for mounting at the sump site or remote from the basin as required. Structure and dimensions to be as shown on drawings.
 - 3. Sump Level Controls: Float switches shall be supplied to control sump level and alarm signal. The switches shall be sealed in a solid polypropylene float for corrosion and shock resistance. The support wire shall have a heavy Neoprene jacket. A weight shall be attached to cord above the float to hold switch in place in sump and efficiently prevent sharp bends in the cord when the float operates. A quantity of 4 floats shall be provided to control level. An additional switch shall be provided with alarm.
 - 4. Check Valve and Piping: The discharge piping shall include a ball check valve with hydraulically sealed discharge flange and gate valve for each pump. Discharge from station shall be fitted with NPT couplings.
 - 5. Basin Cover: Cover shall be of gas tight steel construction with an O.D. equal to the O.D. of the top flange on the basin. Cover shall be secured by the stainless steel bolts and coated with a 3-4 mil thick rust-inhibiting paint.
- H. Circulation Pump: Bronze pump with stainless steel or non-metallic impeller. Shaft shall be stainless steel or ceramic with carbon bearings with EPDM O-ring and gaskets. Replaceable cartridge type circulators shall have stainless steel cartridge. Connections shall be sweat, threaded or flanged. Taco, Bell & Gossett, Grundfos, Armstrong or equal.

PART 3 - EXECUTION

3.01 PIPING INSTALLATION:

A. General:

1. Piping Layout: Piping shall be concealed in walls, above ceilings, or below grade unless otherwise noted. Exposed piping shall run parallel to room surfaces; location to be approved by Owner's Representative. No structural member shall be cut, notched, bored or otherwise altered 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. Expansion joints shall be installed as required. Vertical lines shall be installed to allow for building settlement without damage to piping. All exposed piping to be primed and painted, see painting section.
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 the same suitable alloy as pipe. Welding or brazing shall be performed in accordance with requirements of recognized published standards of practice and by licensed or otherwise certified contractors. Welder or Brazer shall be a person who specialized in welding or brazing of pipes and holds a recognized certificate of competency from a recognized testing laboratory, based on the requirements of the ASME Boiler and Pressure Vessels Code, Section 9.
 - c. Other: Joints other than threaded or welded shall be installed in accordance with manufacturer's recommendations.
 - d. Open Ends: Open ends of piping shall be capped during progress of work to preclude foreign matter.
 - e. Electrical Equipment: Joints shall be avoided, where possible, over electrical equipment.
 - f. Copper pipe 1-1/2" or less may be soldered. Above 1-1/2" and all below grade shall be brazed.
3. Fittings:
 - 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 equipment connections, and elsewhere as necessary for assembly or disassembly of piping.
 - d. Valves: All valves shall be full line size. At equipment connections, valves shall be full size of upstream piping.
4. Pipe Support:
 - a. General: Hangers shall be placed to support piping without strain on joints or fittings. Maximum spacing between supports shall be as specified below. Actual spacing requirements will depend on structural system. Refer to drawings for additional requirements and attachment to structure. Vertical piping shall be supported at floor and ceiling. Support pipe within 12" of all changes in direction. Support individual pipes with pipe hanger. All pressure piping, drainage piping above grade and metallic piping of dissimilar metal from hangers shall have isolating shield, or felted hangers.

i. Screwed Pipe:

Pipe Size Between Supports*	Max. Spacing
(in)	(ft)
1/2	6
3/4	8
1	8
1-1/4 & larger	10

* Based on straight lengths of pipe with couplings only. Provide additional supports for equipment, valves or other fittings.

- ii. Copper Tubing: Copper tubing shall be supported at approximately six (6) foot intervals for piping one and one-half (1-1/2) inches and smaller in diameter and ten (10) foot intervals for piping two (2) inches and larger in diameter.
 - iii. 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. Trapeze: Trapeze hangers of construction channel and pipe clamps may be used. Submit design to Engineer for approval.
 - 5. Excavation and Backfill: Minimum cover on all piping shall be as follows unless otherwise noted:
 - a. Up to 2-1/2" pipe - 24" cover.
 - b. 3" and larger pipe - 30".
 - 6. Miscellaneous:
 - a. Escutcheons: Provide chromium plated 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" clearance between sleeve and pipe or pipe insulation.
 - c. Dielectric Couplings: Dielectric couplings shall be installed wherever piping of dissimilar metals are joined.
 - d. Shock Absorbers: Install per manufacturers recommendations.
- 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.
 - 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. Cleanouts at urinals shall be installed above urinal.
 - 3. Vents: Vents shall terminate not less than 6" above the roof nor less than 12" from any vertical surface nor within 10 feet of any outside air intake. Install horizontal vent lines at 1/4" per foot pitch. Offset vents 2 feet minimum from gutters, parapets, ridges and roof flashing.
- C. Water Piping: Connections to branches and risers shall be made from the side of the 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. Provide ball valve shutoff for each building and at each connection to equipment and trap primers. Shock absorbers shall be installed in a vertical position at end of branch runs as specified in this section whether specifically shown or not on drawings. Connections to equipment shall be made with flexible connectors. Non-metallic pipe shall have 18 AWG copper tracer wire laid on top of pipe and taped in place at 15-foot spacing, terminate 4" above grade at ends of pipe runs.

- D. Gas Piping: Shall be pitched to drain to drip legs at each piece of equipment. No unions shall be installed except at connections to equipment. Provide shutoff at each equipment connection. Connections to equipment shall be made with flexible connectors. Under floor piping shall be sleeved, sealed and vented. Polyethylene or polyvinyl chloride pipe and fittings shall be joined in accordance with manufacturer's recommendation. Metal-to-plastic transition fittings shall be installed at all transitions. Non-metallic pipe shall have 18 AWG copper tracer wire laid on top of pipe and taped in place at 15-foot spacing, terminate 4" above grade at ends of pipe runs. All gas below grade shall have continuous caution tape installed 12" above gas line. All exposed gas piping shall be primed and painted, see painting section.
- E. Condensate Drain Piping: Install with constant pitch to receptacle, 1/4" per foot where possible, otherwise 1/8" per foot minimum. Provide trap at each air handling unit to prevent air leakage. Connections to equipment shall be made with flexible connection unless connection is internally isolated.
- F. Storm Drain Piping: Install at 1/4" per foot pitch.
- G. Flue Piping: Flue piping shall be installed in accordance with its UL listing and manufacturer's instructions.

3.02 PIPING INSULATION INSTALLATION:

- A. Domestic Tempered Water Supply:
 - 1. General: All domestic tempered water supply piping, except for exposed connections to fixtures, shall be insulated. Do not insulate unions or valves less than 2", unless exposed to weather.
 - 2. Install elastomeric pipe insulation by slipping over end of pipe. Where not feasible, slit insulation longitudinally, snap over piping and seal with adhesive. Insulate fittings with larger diameter sleeves or insulation, lapping pipe insulation a minimum of 2 in.
 - 3. Butt sections of insulation tightly together and seal with adhesive to provide a continuous vapor and thermal barrier.
 - 4. 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 sealing tape.
 - 5. Fittings and Valves:
 - a. Wrap fitting with pre-cut fiberglass blanket to thickness matching adjoining insulation. Cover blanket with PVC jacket in accordance with manufacturer's recommendations. Seal all joints with factory supplied pressure sealing vapor barrier tape with 2" (min.) overlap on both sides of joint. Insulate valves to stem.
 - b. For miscellaneous fittings 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 and at least two coats of vapor barrier coating. All exposed ends of insulation shall be adequately sealed.
- B. ADA Compliant Fixtures:
 - 1. At sinks/ lavatories which are to be ADA Compliant, the p-trap and angle stop assemblies shall be insulated with Trap Wrap Protective Kit 500R by Brocar, Truebro Handi Lav-Guard #102W or #105W or equal. Abrasion resistant exterior cover shall be smooth and have 1/8" wall minimum over cushioned foam insert. Fasteners shall remain substantially out of sight.

OR

C. ADA Compliant Fixtures:

1. At lavatories which are to be ADA Compliant the P-Trap and angle stop assemblies & water heater shall be covered with Truebro Lav-Shield, or equivalent. Abrasion resistant exterior cover shall be smooth. Fasteners shall be tamper resistant.

3.03 FIXTURE INSTALLATION:

- A. Fixture Height: Shall be standard height except those specified as ADA Compliant. Such fixtures shall be mounted in accordance with CBC, Section 11B, Division 6 and drawing details.
- B. Wall Hung Fixtures: Shall be provided with proper backing and hanger plates secured to wall. Fixtures mounted on carriers shall bear against stop nuts, clear of wall surface. Caulk fixtures against walls with white G.E. "Sanitary SCS1700" silicone sealant. Caulking shall be smooth and flush with fixture surface (not concave).
- C. Floor Drains or Floor Sinks: Shall be placed parallel to room surfaces, set level, flush with floor and adjusted at proper height to drain and easily accessible for inspection and cleaning. Cover openings during construction to keep all foreign matter out of drain line.
- D. Other Connections: Rough-in and connection for trim or fixtures supplied by others shall be included in this specification section.
- E. Floor Mounted Fixtures: Shall be provided with proper support plates. Caulk fixtures against floors with white G.E. "Sanitary SCS1700" silicone sealant. Caulking shall be smooth and flush with fixture surface (not concave).

3.04 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.
- B. Connections to Equipment: Where size reductions are required for connections to equipment, they shall be made immediately adjacent to the equipment and, if possible, inside the equipment cabinet.

3.05 TESTS AND ADJUSTMENTS:

- A. General: Unless otherwise directed, tests shall be witnessed by the Owner's Representative. 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 his work, and that of other contractors, 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. New sections shall be isolated from existing sections for testing purposes. 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. Test the new sections or branches of piping only.

B. Gravity System:

1. Sanitary Sewer: All ends of the new sections of sewer system shall be capped and lines filled with water to the top of the highest vent, 10 feet 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. Condensate Piping: Maintain 15 psig water pressure for a duration of 4 hours.

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. Test the new sections or branches of piping only.
2. Domestic Tempered, Cold & DI Water Piping: Maintain 60 psig water pressure for a minimum duration of 2 hours.
3. Gas, Vacuum and Air Piping: Maintain 60 psig air pressure for a minimum duration of 2 hours.

D. Accessible Lavatories:

1. Faucet controls and operating mechanisms shall be installed and tested to comply per CBC Section 11B-606.4.

3.06 DISINFECTION:

- A. Disinfect all domestic hot and cold water piping systems in accordance with California Plumbing Code Sections 609.9.1 through 609.9.4. The method to be followed shall be that prescribed by the Health Authority or, in case no method is prescribed by it, the following:
1. The pipe system shall be flushed with clean, potable water until potable water appears at the points of outlet.
 2. The system or parts thereof shall be filled with a water-chlorine solution containing not less than 50 parts per million of chlorine, and the system or part thereof shall be valved-off and allowed to stand for 24 hours; or, the system or part thereof shall be filled with a water-chlorine solution containing not less than 200 parts per million of chlorine and allowed to stand for 3 hours.
 3. Following the allowed standing time, the system shall be flushed with clean, potable water until the chlorine residual in the water coming from the system does not exceed the chlorine residual in the flushing water.
 4. The procedure shall be repeated where it is shown by bacteriological examination made by an approved agency that contamination persists in the system.
- B. Disinfection process shall be performed by certified testing agency or in cooperation with health department having jurisdiction and witnessed by a representative of the Architect. During procedure, signs shall be posted at each water outlet stating, "Chlorination - Do Not Drink". After disinfection, water samples shall be collected by certified testing agency or by health department for bacteriological analysis. Certificate of Bacteriological Purity shall be obtained and delivered to the Owner through the Owner's Representative.

*** END OF SECTION ***

SECTION 23 00 00 - GENERAL MECHANICAL PROVISIONS

PART 1 - GENERAL

1.01 GENERAL CONDITIONS:

- A. The foregoing General and Special Conditions shall form a part of this Division with the same force and effect as though repeated herein. The provisions of this Section shall apply to all the Sections of Division 23.

1.02 CODES AND REGULATIONS:

- A. All work and materials shall be in full 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 specifications shall govern. Applicable codes and regulations are:
 - 1. California Code of Regulations – CCR:
 - a. Title 8, Industrial Relations.
 - b. Title 24, Building Standards.
 - 2. California Building Code – CBC.
 - 3. California Mechanical Code – CMC.
 - 4. California Plumbing Code – CPC.
 - 5. California Green Building Code.
 - 6. Air Diffusion Council – ADC.
 - 7. American Gas Association – AGA.
 - 8. Air Moving and Conditioning Association – AMCA.
 - 9. American National Standards Institute – ANSI.
 - 10. Air Conditioning and Refrigeration Institute – ARI.
 - 11. American Society of Heating, Refrigerating and Air Conditioning Engineers – ASHRAE.
 - 12. American Society of Mechanical Engineers – ASME.
 - 13. American Society for Testing and Materials – ASTM.
 - 14. American Water Works Association – AWWA.
 - 15. California Electrical Code – CEC.
 - 16. National Electrical Manufacturers Association – NEMA.
 - 17. National Fire Protection Association – NFPA.
 - 18. Sheet Metal and Air Conditioning Contractors National Association – SMACNA.
 - 19. Underwriters' Laboratory – UL.
 - 20. Occupational Safety and Health Act - OSHA.

1.03 PERMITS AND FEES:

- A. The Contractor shall take out all permits and arrange for all tests in connection with his work as required by local ordinances. All charges are to be included in the work. Permits for equipment connected to a particular system are to be considered as a part of the work included under each system; for example, permits for electric motor connection are part of electrical work, permits for domestic water or gas connections are part of plumbing work. All charges for service connections, meters, etc. by utility companies or districts shall be included in the work.

1.04 COORDINATION OF WORK:

- A. Layout of materials, equipment and systems is generally diagrammatic unless specifically dimensioned. The actual locations of all materials, piping, ductwork, equipment, supports, etc. shall be carefully planned, prior to installation of any work, to avoid all interference's with each other, or with structural, electrical or architectural elements. Verify the proper voltage and phase of all equipment with the electrical plans. All conflicts shall be called to the attention of the Engineer prior to the installation of any work or the ordering of any equipment.

1.05 GUARANTEE:

- A. Guarantee shall be in accordance with the General Conditions. These specifications may extend the period of the guarantee for certain items. Where such extensions are called for, or where items are normally provided with guarantee periods in excess of that called for in the General Conditions, the Certificate of Guarantee shall be furnished to the Owner through the Engineer.

1.06 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.

1.07 SUBMITTALS:

- A. Submit shop drawings in accordance with Division 01.
- B. 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 and equipment shall not be ordered or installed until written review is processed by the Engineer. Any item omitted from the submittal shall be provided as specified without substitution. All shop drawings must comply with the following:
 - 1. Shop drawings are required for all material and equipment items and shall include manufacturer's name and catalog numbers, dimensions, capacities, performance curves, and all other characteristics and accessories as listed in the specifications or on the drawings. Descriptive literature shall be current factory brochures and submittal sheets. Capacities shall be certified by the factory.
 - 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 marked with the specification paragraph number for which they are proposed. All equipment shall also be identified by the mark number as indicated on the drawings.
 - 3. All capacities, characteristics, and accessories called for in the specifications or on the drawings shall be highlighted, 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.

- C. Substitutions: Manufacturers and model numbers listed in the specifications or on the drawings represent the standard of quality and the features desired. Unless otherwise noted, alternate manufacturers may be submitted for review by the Engineer. Calculations and other detailed data indicating how the item was selected shall be included. The Contractor shall assume full responsibility that substituted items or procedures will meet the specifications and job requirements and shall be responsible for the cost of redesign and modifications to the work caused by these items.
- D. 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.

1.08 OPERATION AND MAINTENANCE INSTRUCTIONS:

- A. Submit one electronic pdf copy for review and after approved submit three hard copies of the Operation and Maintenance Instructions and Wiring Diagrams for all equipment and parts lists for all equipment, 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-1). All wiring diagrams shall agree with revised 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. 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. **(These submittals shall be submitted with regular submittals at start of job so Commissioning Contractor can start on the commissioning check list for LEED Certification or Title 24 Requirements)**
- 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 instruction that applies to the control system. The Engineer's office shall be notified 96 hours prior to this meeting.
- C. Posted: The Contractor shall prepare operation instructions for all systems which shall be typewritten, reviewed by the Engineer, and mounted under glass adjacent to the appropriate temperature control panel. These instructions shall include applicable temperature control diagrams.
- D. Acknowledgment: The Contractor shall prepare a letter indicating that all operation and maintenance instructions (printed, verbal and posted) 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.

1.09 RECORD DRAWINGS:

- A. The Contractor shall maintain a set of prints for the project as a record of all construction changes 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. buildings, curbs and walks. In addition, the water, gas, under-floor ducts, etc. within the building shall be recorded by offset distances from building walls. The original drawings will be made available to the Contractor from which he shall have a set of reproducible drawings made. The Contractor shall then transfer the changes, notations, etc. from the marked-up prints to the reproducible drawings. The record drawings (marked-up prints and reproducibles) shall be submitted to the Engineer for review (as an alternative, the marked-up prints may be photocopied full size on reproducible stock).

PART 2 - PRODUCTS

2.01 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. Manville Corporation. Protective coating shall be extended 6" above surrounding grade.

2.02 CONCRETE ANCHORS:

- A. Concrete Anchors shall comply with CBC 1901A.3. Steel stud with expansion anchor requiring a drilled hole; powder driven anchors are not acceptable. Minimum concrete embedment shall be 4-1/2 diameters. Minimum spacing shall be 10 diameters center-to-center and 5 diameters from center to edge of concrete. Maximum allowable stresses for tension and shear shall be 80% of the test report values "with special inspection". Anchors shall be Hilti, Philips - or Approved equal.

2.03 SEISMIC RESTRAINTS:

- A. Refer to construction documents for seismic bracing details.

2.04 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 preprinted markers or stenciled marking, and include arrows to show the direction of flow. 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 floor, walls or ceilings or otherwise pass into inaccessible spaces, and at 50' maximum intervals along exposed portion of lines. Marking of short branches and repetitive branches for equipment connections is not required.
- B. 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-1). Provide 1/2" high lettering, white on black background. Nameplates shall be permanently secured to the unit.

- C. Valves: Provide valve tags on all valves of each piping system, excluding check valves, valves within equipment, shut-off valves at equipment and other repetitive terminal units. Provide brass tags or plastic laminate tags. Prepare and submit a tagged valve schedule, listing each valve by tag number, location and piping service. Mount in glazed frame where directed.
- D. Controls: Label all panels, thermostats and by-pass timers with plastic laminated, engraved nameplate which bears the unit mark number as indicated on the drawings (e.g. AC-1). Provide 1/4" high lettering, white on black background. Nameplates shall be permanently secured to the unit.

2.05 EQUIPMENT SUPPORT FRAMES:

- A. Unless specifically noted otherwise, it shall be the responsibility of Mechanical Contractor to furnish and install all support frames for its equipment.

PART 3 - EXECUTION

3.01 SCHEDULING OF WORK:

- A. All work shall be scheduled subject to the approval of the Engineer and Owner. No work shall interfere with the operation of the existing facilities on or adjacent to the site.

3.02 CONDUCT OF WORK:

- A. 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 Divisions engaged upon this project or to the Owner.
- B. Mechanical Contractor shall arrange for all cutting necessary for the proper installation of its work, providing all sleeves and chases necessary. Cutting shall not be done in such a manner to impair the strength of the structure. Any damage resulting from work shall be repaired by the Contractor at his expense to the satisfaction of the Engineer.
- C. Progressively, daily at the completion of each day's work, 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.
- D. **IAQ Management plan will be in effect for LEED Certification, including the sealing of duct ends before and during rough-in, specific requirements for the use of HVAC equipment during construction (if used at all), building flush-out, etc. Adhesives and mastic must comply with low VOC requirements and documentation (MSDS, etc.) shall be provided with submittals.**

3.03 EXCAVATION AND BACKFILL:

- A. Excavation: Trenches are to be excavated to grade and depth established by drawings. Unless otherwise noted, minimum earth cover above top of pipe shall be 24", not including base and paving in paved areas. Width of trenches at top of pipe shall be a minimum of 16" plus the outside diameter of the pipe. Provide all shoring required by site conditions. Barrel of pipe shall have uniform support on trench bottom, hand excavate additional depth at bells, hubs and fittings. Where over-excavation occurs, provide compacted selected backfill to pipe bottom. Where ground water is encountered, remove to keep excavation dry, using well points and pumps as required.

B. Backfill:

1. Around Pipe and to One Foot Above Pipe: Material shall be river run sand or native granular free flowing material, free of clay lumps, silt or vegetable matter and shall have 100% passing through the No. 4 sieve and a maximum of 3% passing through the No. 200 sieve. 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 to 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 approval by the Engineer.
3. Remove all water sensitive settlement from trench backfill regardless of location and compaction requirements.

- C. Compaction: Compact to a density of 95% within building and 90% outside building. Demonstrate proper compaction by testing at one-half of the trench depth. Perform three tests per 100' of trench.

3.04 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. The actual openings and the required cutting and patching shall be provided. 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 also be provided. Cutting and 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.

3.05 MANUFACTURER'S RECOMMENDATIONS:

- A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of a 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.

3.06 QUIETNESS:

- A. Piping, ductwork and equipment shall be arranged and supported so that vibration is a minimum and is not carried to the building structure or spaces.

3.07 DAMAGES BY LEAKS:

- A. The Contractor shall be responsible for damages to other work 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 to other work caused by disconnected pipes or fittings, and the overflow of equipment prior to completion of the work.

3.08 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.

END OF SECTION 23 00 00

SECTION 23 00 01- HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.01 GENERAL CONDITIONS:

- A. The foregoing Section 23 00 00, General Mechanical Provisions shall form a part of this specification.

1.02 SCOPE:

- A. Included: Perform all work necessary and required to complete construction as indicated. Such work includes the furnishings of all labor, materials and services necessary for a complete, lawful and operating air conditioning, heating, ventilating system with all equipment as shown or noted on the drawings or as specified herein. The work includes, but is not necessarily limited to, the following:
 - 1. Heating, ventilating and air conditioning equipment.
 - 2. Air distribution system (Ductwork, Air Terminals, etc.).
 - 3. System insulation.
 - 4. Controls and control wiring and conduit for control wiring.
- B. Work Specified Elsewhere:
 - 1. Line voltage power wiring (60 volts or greater), motor starters in motor control centers, and disconnect switches are included in the electrical section.
 - 2. Connection of gas and condensate drains to equipment.
 - 3. Access doors.

PART 2 - MATERIALS

2.01 DUCTWORK MATERIALS:

- A. General: All ductwork materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL-181 not exceeding a flame spread of 25 and smoke developed of 50. All ductwork shall be per Chapter 6 of the CMC.
- B. Low Velocity Metal Ductwork: Metal ductwork shall be minimum 26 gauge galvanized sheet steel, ASTM A527.
- C. Low Velocity Flexible Ductwork: Insulated flexible ductwork. Continuous internal liner bonded to galvanized steel wire helix. One pound per cubic foot glass fiber insulation, R-8. Thermal conductivity shall not exceed 0.13 Btu/hr sq. ft.- degrees F at a mean temperature of 75°F. Seamless vapor barrier jacket. Each length shall have a factory installed metal sleeve at each end. Duct shall be capable of continuous operation at 1.5" of water static pressure and 4000 ft./min. air velocity. Maximum length 5 ft., single piece at runouts to air terminals. Genflex, Lamborn or equal.
- D. Spiral Duct: Ductwork shall be galvanized steel with uni-seal spiral seamlock and uni-seal fittings, ASTM A653. United McGill Corp or equal. All exposed spiral duct shall be painted, color selected by Owner.
- E. Round Duct on Roof: Ductwork shall be double wall insulated galvanized steel with solid welded seam longitudinal seam-K27. United McGill Corp or equal.
- F. Bonding Adhesive: Durodyne WBG, Scotchgrip Adhesive 4230 or equal.

G. Duct Mastic: Minnesota Mining and Manufacturing Duct Sealer 800, Tuff-Bond No. 12, Glencoat Seal-Flex or equal.

H. Duct Joints:

1. As an option to joints and seams designated by SMACNA or shown on Drawings, the following systems may be used:
 - a. Ducts with sides 24 inches to 48 inches, transverse duct joint system by Ductmate Jr., Nexus or equal (SMACNA "E" Type connection).
 - b. Ducts 48 inches and larger, Ductmate Regular, Nexus (SMACNA "J" Type connection) or equal.
- I. Fiber Tape: Mineral impregnated fiber tape and plastic activator-adhesive. Hardcast Inc., United McGill Uni-Cast or equal.

2.02 AIR TERMINALS AND DUCT FITTINGS:

A. Grilles: (Grilles, Registers and Diffusers)

1. Information on Drawings: Refer to the Air Distribution Schedule on the drawings for the list of grilles. Manufacturer's model numbers are listed to complete the description. Equivalent models of T & B, Krueger, Anemostat, Price, Titus or equal. Refer to the floor plans for neck size, CFM, air diffusion pattern, and fire damper, if required.
2. Performance: If, according to the certified data of the manufacturer of the proposed units, the sizes indicated on the drawings will not perform satisfactorily, the units shall be re-selected by the Contractor for the proper diffusion, spread, drop and throw.
3. Frame and Accessories: All supply, return, and exhaust grilles shall be provided with cushion heads and attachments to structure, unless otherwise noted. All surface mounted grilles shall have a perimeter gasket and flanged edge. All grilles shall have frames suitable for mounting in the surfaces designated by the architectural drawing, coordinate prior to ordering.
4. Finish: All ceilings and wall grilles shall have a paintable white finish unless otherwise noted. Interior components shall be flat black.

B. Turning Vanes: Double wall, hollow metal, air-foil shape. Spacing in accordance with manufacturer's recommendations. Aero Dyne, HEP or equal.

C. Flexible Connection: UL listed neoprene coated 30-ounce fiberglass cloth. 3" metal, 6" fabric, 3" metal. Ventglas or equal.

D. Branch Duct Volume Damper: Volume control damper (VCD) in rectangular ducts shall be as follows: Opposed blade, 6" maximum blade width, 16-gage blade, 48" maximum length, nylon or oil impregnated bronze bearings, 1/2" diameter pin shaft, 16-gage channel frame, actuating rod and linkage out of air stream. VCD in round duct shall be as follows: Damper blade full height of branch and 1" less than branch width. All branch dampers shall have regulator with stamped steel handle, spring loaded shaft nut, cast body and serrated self-locking die cast core. Regulator for horizontal ducts overhead shall be mounted on sides or bottom of ducts. Secure a 12" length of brightly colored plastic ribbon to handle for ease of location. Where rectangular or round ductwork is insulated, slit insulation to allow handle to protrude. Ventlok 641 (with 607 end bearing for round ducts).

2.03 DUCTWORK INSULATION MATERIALS:

A. General: All ductwork insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL-181 not exceeding a flame spread of 25 and smoke developed of 50.

- B. Acoustic Lining: Glass fiber. One side coated to prevent fiber erosion up to 6000 ft./ min. Average noise reduction coefficient of 0.90. 0.13 Btu/ hr – sq. ft. – degrees F conductivity at a mean temperature of 75 degrees F, R-8. CSG Insulation Corp., Schuller, Owens-Corning, Knauf or equal. Duct dimensions shown on drawings for lined duct are clear (net) opening inside of lining.
- C. Fiber Glass Blanket: Foil faced, 0.13 Btu/ hr – sq. ft. – degrees F conductivity at a mean temperature of 75 degrees F, R-8. CSG Insulation Corp., Schuller, Owens-Corning, Knauf or equal.
- D. Bonding Adhesive: Benjamin Foster 85-15 or equal. .

PART 3 – EXECUTION

3.01 DUCTWORK INSTALLATION:

- A. General:
 - 1. Standards: Unless otherwise noted, all ductwork shall be constructed and installed in accordance with current SMACNA "HVAC Duct Construction Standards". Ductwork and accessories shall be installed in a manner to prevent vibration and rattling.
 - 2. Seismic bracing: Refer to Construction Documents for seismic bracing details.
 - 3. Duct Access Doors: Provide access doors as required to adjust equipment and dampers.
 - 4. Flexible Connections: Connections of ductwork to all equipment shall be with 6" (min.) flexible connection. Install with ample slack and uniform gap after deflection of vibration isolators. There shall be no metal to metal contact across flexible connection. Protect outdoor connections with weatherproof metal shroud on top and sides, no metal-to-metal contact. Provide at all seismic joints.
 - 5. Ducted Returns: All air handling that is not directly located in the space that it serves shall have ducted returns.
 - 6. Open ends of ductwork shall be covered during construction to keep inside clean.
- B. Low Velocity-Low Pressure (up to 2000 ft/ min; up to 2.0 in. water):
 - 1. Sheet Metal Ductwork:
 - a. Ells: Ells with less than standard radius and square ells shall be fitted with turning vanes.
 - b. Tees: Tees shall be straight tap-in with extractor or 45 degree takeoff, as shown on drawings.
 - c. Duct Joints: Seal duct joints airtight with fiber tape and adhesive per manufacturer's printed instruction. Ducts in weather shall be sealed air and water tight with duct mastic before closing and taping.
 - i. Where Ductmate type joints are used, the manufacturer's designated procedure shall be followed. Ductmate joints on roof shall have continuous cleat on top duct flange to prevent water from collecting on gasket.
 - d. Dampers: Install volume control damper and damper regulator in all branch ducts.
 - e. Duct dimensions shown on drawings for lined ducts, are clear net openings inside of lining.
 - f. Top of ducts exposed to weather shall be cross broken and sloped slightly to each side to allow rain water to run off. Ducts that do not drain off top will be rejected and need to be replaced at contractors' expense.

2. Flexible Glass Fiber Ductwork: Hangers shall be 2" wide metal straps spaced to prevent sagging, 3 feet spacing maximum. Insert 6" wide fiberglass pad between duct and hanging strap. All joints and fittings shall be sheet metal and shall be installed with metal bands or 3 (min) self-tapping screws and fiber tape. Maximum length of flexible duct shall be 5 ft. Single piece minimum length shall be 3 ft. Minimum turn radius shall be in accordance with SMACNA Standards (turn radius to duct centerline not less than 1.5 times the duct diameter).

3.02 AIR TERMINALS AND DUCT FITTINGS INSTALLATION:

- A. General: Unless otherwise noted, all air terminals and duct fittings shall be installed in accordance with current SMACNA "HVAC Duct Construction Standards", details on drawings and manufacturers instructions. Terminals and fittings shall be installed in a manner to prevent vibration and rattling.
- B. Fire Smoke Damper: Fire smoke dampers shall be installed in accordance with their State Fire Marshal approval and the manufacturer's recommendations.

3.03 DUCTWORK INSULATION INSTALLATION:

- A. General: All supply and return sheet metal ductwork shall be insulated.
- B. Concealed Ductwork: Wrap ductwork with fiberglass blanket lapped 2" minimum. Secure with foil tape at all joints for a complete vapor barrier.
- C. Acoustic Lining: All ductwork in equipment rooms, where exposed to weather, and elsewhere as indicated on drawings, shall have acoustic lining. Increase each sheet metal dimension to accommodate lining and maintain clear inside duct dimensions shown on drawings. Apply lining with bonding adhesive in accordance with manufacturer's recommendations and also secure with mechanical fasteners in accordance with SMACNA Standards. Seal exposed edges of lining with bonding adhesive.

3.04 HVAC DUCT CLEANING:

- A. General: Duct cleaning procedures shall be done per National Air Duct Cleaners Association (NADCA), ACR 2006 Guidelines. Contractor shall thoroughly clean all existing ductwork and grilles to remain shown on drawings with a brush and vacuum system. All workers who may potentially breathe duct contaminants or biocides should wear suitable protective breathing apparatus. Also workers should look for other types of problems, such as holes or gaps in the ducts. After duct cleaning, a video inspection shall be done for owner review. Inspector to be present during video inspection. The video shall be performed on all ductwork runs with adequate lighting at the camera and adequate reference point, grilles, etc.
- B. Work Schedule: All work shall be performed in accordance with the time provisions of the contract. Contractor shall perform work according to a pre-approved schedule with General Contractor, and to complete the work on schedule.
- C. Power Vacuum Equipment: Vacuum shall be equipped with final High efficiency Particulate Efficiency (HEPA) filtration to protect surrounding environment from recontamination by disbursement of contaminants removed from air ducts. As an option, contractor may use a collection unit outside of the building. It shall be the contractor's responsibility to remove and dispose of all contaminants from jobsite at contractor's expense.

- D. Supervision: All work shall be supervised by an on-site skilled foreman with thorough knowledge and experience in the cleaning of heating, ventilating and air conditioning systems. Supervisor shall have a minimum of 5 years experience in duct cleaning.
- E. Cleaning Process: All ducts shall be cleaned and inspected as work proceeds. Ductwork shall be cleaned by attachment of HEPA power vacuum hose to isolated section of air duct and by combining brushes and reverse air nozzles, to remove all contaminants from the surface of air duct interior. As the brushes and reverse air nozzle are being operated, all contaminants shall be drawn into the HEPA vacuum unit (minimum 5,000 CFM HEPA vacuum to maintain velocity necessary to keep particulate airborne – 3500 FPM). All foreign materials such as dust, mold, soot, lint, bacteria and other air residues shall be removed from air ducts. Fan powered high efficiency dust and particulate collection units shall be connected to the supply outlets. The collection systems shall be a self-contained unit, with appropriate components to adequately prevent dirt and debris, loosened from upstream ducts during cleaning operations, from entering the conditioned spaces by capturing this debris within the collection device.
1. Special care and attention shall be given to air ducts having interior lining and a light vacuum process shall be used to prevent damage to air side surfaces. All loose fibrous materials shall be removed by a combination of controlled air pressure and power vacuum.
 2. Any major repairs not included in contract shall be brought to the owner's attention.
 3. The air handling unit should not be used during the cleaning process. Also, after duct cleaning has been completed, the air handler should be run one (1) hour to allow at least 8 air changes in the area cleaned before being occupied.
 4. When gaining access to sheet metal ducts for cleaning use existing duct systems openings where possible. However, where holes need to be cut for access it is essential to seal the access hole properly in order to maintain the integrity of the HVAC system.
- F. Clean Up: Contractor shall, at the end of each shift, remove all waste, dirt and debris, resulting from work performed. Such materials shall be removed from the property and disposed of at the expense of the contractor.
- G. Place filter media in all supply diffusers to ensure no contaminants are emitted into areas during cleaning.
- H. Cut access panels where necessary by use of sheet metal cutting devise. Access into supply side, then cover with 24 gauge metal gasket seal. Apply sheet metal screws for an airtight seal. Where necessary in concealed attic spaces Contractor will install ceiling access points. Provide gasketed removable access panels at the following locations:
1. Adjacent to turning vanes.
 2. Adjacent to dampers (balancing, fire, control, back-draft, splitter, etc.).
 3. Upstream of VAV boxes.
 4. Next to duct transitions, offsets and changes of direction.
 5. Adjacent to all other in-duct mechanical components and sensors.
- I. At any time when ducts are large enough Contractor will enter the ductwork to clean by hand.
- J. Wherever the grilles and/ or diffusers are removable, they shall be removed, vacuum cleaned, washed, dried and then replaced at the original setting. Welded grilles may be cleaned in place.
- K. Sanitizing the air distribution network shall be performed as required. Using a suitable atomizing spray wand inserted through the access points, coat all interior surfaces of the duct work with a fine mist of a EPA registered sanitizing fluid: Oxine or equal.
- L. Where necessary place plastic covers on all office furnishings and equipment to protect it from dirt and debris.

- M. Supply color codes on blueprints to indicate work performed during the last shift.
- N. Supply progress report to the Engineer on work completed and work to be performed on a shift by shift basis.
- O. Supply M.S.D.S. sheets on all cleaners that are used in the cleaning process.

3.05 SYSTEM AIR BALANCE:

- A. Scope: Provide the services of a qualified independent test and balance agency certified by the Associated Air Balance Council (AABC) or The National Environmental Balancing Bureau (NEBB) to test, adjust and balance, retest, and record performance of the system to obtain design quantities as specified. Balancing contractor must also be TABB certified and have a C-20 license.
- B. Qualifications: Prior to commencing work, the agency shall be approved by the Owner's Representative.
- C. Instruments: All instruments shall be accurately calibrated; calibration histories shall be available for examination. Application of instrumentation shall be in accordance with AABC standards.
- D. Procedure: General: Balanced quantities shall be plus 5%, minus 5% of design quantities. All name-plate data, manufacturer, model, and serial numbers shall be recorded for each item tested.
- E. Extended Warranty: The test and balance agency shall include an extended warranty of 90 days after completion of test and balance work, during which time the Owner's Representative at his discretion may request a recheck or resetting of any item or items in test report. The agency shall provide technicians to assist the Owner's Representative in making any tests he may require during this period of time.
- F. Air Balance Procedure (for each Air Handling System):
 - 1. All air filters shall be clean when air balance is performed.
 - 2. Provide a sketch of the equipment showing exactly where all pressure readings were taken.
 - 3. Adjust blower RPM to design requirements.
 - 4. Record motor full load amperes.
 - 5. Make pitot tube traverse of main supply and return ducts and obtain design CFM at fans.
 - 6. Record system static pressures, inlet and discharge.
 - 7. Record filter quantity, size(s) and pressure drop across filter(s) at each filter bank.
 - 8. Adjust system for design CFM recirculated air.
 - 9. Adjust system for design CFM outside air.
 - 10. Record entering air temperatures. (DB heating, DB and WB cooling.)
 - 11. Record leaving air temperatures. (DB heating, DB and WB cooling.)
 - 12. Adjust all main supply and return air ducts to design CFM.
 - 13. Adjust all zones to design CFM, supply and return.
 - 14. Adjust all diffusers, grilles and registers to plus 10%, minus 0% of design requirements.
 - 15. Adjust CFM at all exhaust fans, make-up units, etc. (high and low speed, where applicable). Record applicable data from items 1 through 11 above.
 - 16. Each grille, diffuser and register shall be identified as to location.
 - 17. Verify proper diffusion pattern for all ceiling grilles and that all sidewall grilles are set for 5 degrees downward deflection unless otherwise noted. Make a notation of any that are not set properly.

18. Size, type and manufacturer of diffusers, grilles, registers and all tested items shall be identified and listed. Manufacturer's ratings shall be used to make required calculations on all items.
 19. Readings and tests of diffusers, grilles, and registers shall include required FPM velocity and test resultant velocity, required CFM and test resultant CFM after adjustments.
 20. In cooperation with the control manufacturer's representative, set adjustments of automatically operated dampers to operate as specified. Testing agency shall check all controls for proper calibrations and list all controls requiring adjustment by control installers.
 21. All diffusers, grilles and registers shall be adjusted for required air patterns and to minimize drafts.
 22. As a part of the work of this contract, THE AIR CONDITIONING CONTRACTOR shall make any changes in pulleys, belts, dampers or the addition of dampers cleaning of insect screens and replacement of filters required for correct balance as recommended by air balance agency, at no additional cost to Owner.
 23. Set, test and adjust packaged heating/ cooling unit economizer operation in cooperation with controls contractor. Record minimum and maximum outside and exhaust airflows.
- G. Water Balance Procedure:
1. Set valves for maximum coil flow.
 2. Remove and clean all strainers.
 3. Examine water in system and determine if water has been treated and cleaned.
 4. Check expansion tanks to determine that they are properly charged and that the system is completely full of water. Bleed air from system.
 5. Adjust water flow through boilers, to design flow.
 6. Record leaving and return water temperatures at boiler. Reset to correct design temperature.
 7. Record the following at each coil:
 - a. Inlet water temperatures.
 - b. Leaving water temperatures.
 - c. Pressure drop across coil.
 - d. Pressure drop across bypass valve.
 8. Record pump suction and discharge pressures at operating condition and also with pump discharge valve completely closed.
 9. Record running amperage of pump motor at operation condition and also with pump discharge valve completely closed.
 10. Record water metering device readings.
- H. Test, adjust and retest water bleed rates from evaporative coolers. Record all data.

- I. Acoustic Performance Testing: Provide acoustic performance testing in accordance with the requirements of EQ3.0 of the "California Criteria for High Performance Schools, Best Practices Manual, 2009 Edition".
 1. Maximum Background Noise Level: Unoccupied classrooms must have a maximum background noise level of no more than 45 dBA LAeq. The standard anticipates two primary noise sources, steady HVAC equipment noise and the usually unsteady exterior environmental noise. Where the measured ambient noises due to sources other than HVAC are within 5 dB of the measured overall noise (HVAC and exterior intrusive noise) a measurement of at least ½ hour duration shall be made in at least two classrooms in each building in the worse case (noisiest) locations on the school site during normal school days and hours.
 - a. To evaluate the significance of intrusive exterior noise, a 30-minute Equivalent Sound Level (LAeq30, in general conformance with ANSI S12.60-2002, Annex E3) measurement shall be made in the classroom that is subjectively assessed to represent the worse case exposure to exterior noise, with the HVAC system not in operation. This Leq30 measurement shall be repeated with the HVAC in operation. If the second "HVAC-on" sound level is more than 5 dB greater than the initial "HVAC-off" measurement, exterior noise intrusion shall be deemed "not significant".
 - b. Where intrusive exterior noise has been deemed "not significant" short-term (15 second) A-weighted sound level measurements shall be made in each classroom with the HVAC systems in operation. Where exterior intrusive noise has been deemed "significant" (per the evaluation method noted above), LAeq30 sound level measurements shall be made in each classroom with the HVAC system in operation. In either case, where classrooms are served by variable-air-volume systems, the systems shall be operated at maximum nominal flow (typically by means of varying the thermostat set point).
 - c. Where exposure to exterior noise varies significantly between groups of classrooms (e.g. one side of a classroom wing adjacent to a street, the other side facing away), separate evaluations of exterior noise significance can be conducted to limit the need for LAeq30 measurements.
 2. Maximum Reverberation: Classrooms less than 10,000 cubic feet must have a 0.6-second maximum (unoccupied) reverberation time and classrooms with volumes between 10,000 cubic feet and 20,000 cubic feet must have a 0.7-second maximum (unoccupied, furnished, and fitted-out) reverberation time. (ANSI Standard S12.60-2002). The reverberation times shall be measured in each classroom in three octave bands with center frequencies of 500, 1000, and 2000 Hz. The arithmetic average of the three measured values shall be compared to the standard.

END OF SECTION 23 00 01

SECTION 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Materials and equipment shall be furnished and installed in support of electrical work described in these plans and specifications including but not limited to, raceways, boxes, enclosures, feeders, branch circuiting, supports, terminal cabinets, sleeves, gutters, panels, transformers, switchgear, lighting fixtures, controls, relays, contactors, in order to complete and make fully functional the systems described.
 - 2. Complete fire alarm and annunciation system as shown and/or required by the (local jurisdiction having authority, California State Fire Marshal) including monitoring equipment and wiring for central station connection.
 - 3. Lighting systems, both interior and exterior as shown on the plans and as specified herein, including controls, occupancy sensors, lumen sensors, photocell controls, LED'S supports, fasteners, straps, and miscellaneous mounting hardware and support structures for such equipment.
 - 4. HVAC and plumbing electrical: Conduit, conductors and terminations for all line voltage power, line voltage controls and fusible and/or non-fusible safety disconnect switches for HVAC equipment, including but not limited to air conditioners, furnaces, fans, heat pumps, system pumps, condensing units. Provide protective equipment unless otherwise noted, etc. including protective devices.
 - 5. Power and Lighting Distribution: Furnish and install power and lighting distribution systems including but not limited to panels, feeders, transformers, branch circuits, devices, fixtures, disconnect switches, contactors, controls, etc. for a complete working system.
 - 6. Data systems infrastructure including all boxes, raceways, cable tray, wire basket tray, dedicated branch circuits, sleeves and penetrations, etc. as described and as shown in plans, risers, specifications and/or required for a complete and operating system.
 - 7. Allocation of time to adequately train the Owner on the use and operation of all systems installed within the facility or on the property.
- B. System Description:
 - 1. The electrical plans indicate the general layout and arrangement; the architectural drawings and field conditions shall determine exact locations. Field verify all conditions and modify as required to satisfy design requirements as well as code minimums. Maintain all required working clearances as described in CEC Article 110 as well as other applicable articles.
 - 2. Discrepancies shall be brought immediately to the attention of the Architect for clarification. The Architect shall approve any changes. Prior to rough-in, refer to architectural plans that shall take precedence over electrical plans with respect to locations.
- C. Related Work Under Other Sections:
 - 1. Mechanical Wiring: Control circuit wiring, energy management controls and interlocks for mechanical equipment shall be installed by Mechanical Contractor.

2. HVAC Control Raceway: Raceways, boxes, and control wiring for thermostats, temperature sensors and control components specified within the mechanical specifications, shall be furnished and installed as required, and installed in accordance with the minimum wiring methods allowed for branch circuit wiring in Division 26.
3. Smoke Fire Dampers: Coordination with Mechanical plans for exact locations and points of connection for power and fire alarm system connections (power and fire alarm connection shall be by Electrical Contractor).
4. Duct mounted smoke detectors: Coordination with Mechanical plans for exact locations and points of connection for power and fire alarm system connections (power and fire alarm connection shall be by Electrical Contractor).

1.3 SUBMITTALS AND SHOP DRAWINGS

- A. Before construction, submit in accordance with the General Conditions of this Specification.
- B. Manufacturers' specifications, catalog cuts and shop drawings as required to demonstrate compliance with the specifications. Identify specific intended use for each component where submittal may be ambiguous. Submit entire bound submittal at one time; partial submittals will not be accepted. At a minimum, submittals will be required for the following:
 1. Distribution equipment including transformers, distribution panels and breakers, motor controls, distribution and branch circuit panels, grounding, surge protection device, etc.
 2. Electrical equipment including disconnects, fuses, raceways, straps and racks, fittings, conductors, boxes, gutters, devices, plates, etc.
 3. Lighting equipment including fixtures, LED's, mounting accessories, color charts (where required), etc.
 4. Lighting control equipment including low voltage switching system, dimmer switchbank / accessories, occupancy sensing equipment, time clocks, contactors, photocells, lumen sensors, etc.
 5. Complete system component submittals for:
 - a. Voice Public Address System / Intercom / Clock.
 - b. Fire Alarm System.
 - c. Communication Systems including but not limited to; cable, fiber, terminations, cable management, cable tray, patch panels, equipment racks, cabinets, jacks, plates, cable labeling.
 6. Conduit including all fittings, etc.
 7. Wiring and cable, etc.
 8. Fire rating penetration materials, etc.
- C. The intent of these specifications is to establish a standard of quality for materials and equipment. Therefore, some items are identified by manufacturer or trade name designation. Substitutions shall be subject to the Architect's approval. Where the substitution will affect other trades, coordinate all changes with those trades concerned and pay any additional costs incurred by them as a result of this substitution. Approval of substitutions shall not relieve the Contractor from providing an operational system in accordance with all applicable codes and ordinances.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Storage of equipment for the job is the responsibility of the Electrical Contractor and shall be scheduled for delivery to the site, as the equipment is required. Damage to the equipment delivered to the site or in transport to the job shall be the responsibility of the Electrical Contractor.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Materials shall be new and bear the label of or be listed by a nationally recognized testing laboratory. The quality and suitability of all materials shall conform to the standards and practices of this trade.
- B. Supplied materials shall be of a current manufactured product line. Discontinued products are not acceptable. Where products are identified on the contract documents by part number, EC may supply the current product model or series which meets the specification and intended use of the specified component.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Professionalism and appearance of installations shall be in accordance with accepted practices of this trade. Installation methods shall conform to manufacturers' specifications and recommendations. The Contractor shall man the job with qualified journeymen and helpers in this trade for the duration of the job. It is the Contractor's responsibility to communicate with and keep the job superintendent apprised of changes or clarifications, etc.
- B. Employment of any person on any job in the capacity of an electrician is not permitted unless such person has qualified for and holds a valid Journeyman Electrician Pocket Card or General Journeyman Electrician Certificate issued by the State of California Division of Apprenticeship Standards except, Contractor may employ electrical helpers or apprentices on any job of electrical construction, new or existing, when the work of such helpers or apprentices is performed under the direct and constant personal supervision of a journeyman electrician holding a valid Pocket Card accepted by the State of California Division of Apprenticeship Standards:
 - 1. Each Pocket Card carrying journeyman electrician will be permitted to be responsible for the quality of workmanship for a maximum of one helper or apprentice during any same time period, provided the nature of work is such that good supervision can be maintained and the quality of workmanship is the best, as expected by Owner and implied by the latest edition of the National Electrical Code.
- C. Materials shall be installed in accordance with the manufacturers' specification and recommendations. They must conform to the approval AHJ adopted codes and standards, but not less than the 2019 CEC and all applicable codes and standards, including but not necessarily limited to California Code of Regulations Title 24, NFPA, National Electrical Manufacturers Association, ANSI, CBC, and any other adopted ordinances of applicable agencies having jurisdiction.
- D. Electrical Contractor shall lay work out in advance in order to avoid unnecessary cutting, chasing, and drilling of floors, walls, ceilings and other surfaces. Work of this nature shall be carefully done so as not to damage work already performed by other trades. Such alterations shall not depreciate the integrity of the structure. Approval for cuts or penetrations in structural members shall be by the Architect.
- E. Supporting Devices:
 - 1. Verify mounting height of all luminaires or items prior to installation when heights are not detailed.

2. Install vertical support members for equipment and luminaires, straight and parallel to building walls.
 3. Support conduits within 18" of outlets, boxes, panels, cabinets and deflections. Maximum distance between supports not to exceed spacing per CEC.
 4. Securely suspend all junction boxes, pull boxes or other conduit terminating housings located above suspended ceiling from the floor above or roof structure to prevent sagging and swaying.
 5. Provide seismic bracing per CBC requirements for this building location.
 6. Supporting Devices: Safety factor of 4 required for every fastening device or support for electrical equipment installed. Support to withstand four times weight of equipment it supports. Bracing to comply with seismic design category as per Structural Engineer.
- F. Coordinate work with other trades as required to eliminate any delays during construction. Coordinate changes with other prime contractors to avoid construction conflicts.
- G. Engineer's Field Observation: Site visits during construction for field observations and reports will be conducted by electrical engineer when directed by the Architect. A list of items that need to be addressed will be submitted to the Architect for forwarding to the Contractor.
- H. Drawings of Record: Provide a full and accurate set of field record drawings marked up in a neat and understandable manner submitted to the Owner Representative, Construction Manager, or Architect upon completion of the work and prior to issuance of a certificate of completion. The drawings shall dimension all electrical facilities including but not limited to underground conduit, vaults, boxes as well as conduit routing scaled to within 12" of actual field conditions and shall be kept up to date reflecting changes or deviations. Electrical facilities shall be accurately drawn on the plan to scale. Refer to the general conditions of these specifications for additional requirements. Record drawings shall be required to identify both horizontal and vertical dimensions to visible and fixed points such as concrete, asphalt, buildings, sidewalks, etc.
- I. Identification: Provide engraved laminated plastic nameplates for all switchboards, panelboards, fire alarm terminal cabinets, telephone and cable television backboards, main devices, control panels, time clocks, contactors and safety disconnect switches accurately identifying each device. Labels shall be attached to the equipment by means of screws or rivets. Self-adhering labels will not be acceptable. Refer to Section 26 05 53: Identification of Electrical Systems.
- J. Safety: The Electrical Contractor is responsible to maintain equipment in a safe and responsible manner. Keep dead front equipment in place while equipment is energized. Conduct construction operations in a safe manner for employees as well as other work persons or anyone visiting the job site. Provide barriers, trench plates, flags, tape, etc.
- K. Guarantees: Equipment and labor shall be guaranteed and warranted free of defects, unless otherwise stated to be more restrictive, for a period of one year from the date of final acceptance by the Owner. A written warranty shall be presented to the Architect at the time of completion prior to final acceptance. Equipment deemed to be damaged, broken or failed should be repaired or replaced at no additional cost to the Owner. Materials or system requiring longer than a one-year warranty as described herein shall be separately warranted in separate letters of guarantee stating the duration of warranty.

- L. Operating and Installation Manuals: Provide two copies each of manuals, operating and installation instructions for equipment indicated in submittal packages. Instruct the Owner's representative as to the operation and location of equipment necessary to allow them to operate the facility upon final acceptance. This instruction period shall be prearranged with the Owner's representative prior to occupancy of the facility and the weeks prior to training scheduled.

END OF SECTION 26 05 00

SECTION 26 05 01 – SELECTIVE ELECTRICAL DEMOLITION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Divisions 01 Specification Sections, apply to this section.

1.2 SUMMARY

- A. This section includes:
 - 1. Electrical demolition.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work shall be as specified in individual sections.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Contractor to walk job to observe existing conditions and account for variance as needed.
- B. Verify field measurements and circuiting arrangements as shown on drawings.
- C. Verify that abandoned wiring and equipment serve only abandoned facilities.

3.2 PREPARATION

- A. Disconnect electrical systems as required under this contract.
- B. Coordinate work with the District. No demolition work shall begin without the District's approval.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, observe provisions of NFPA 70E and CALOSHA, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area as required.

- E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted, or alternate arrangements have been made with owner (e.g. – Fire Watch). Disable system only to make switchovers and connections. Coordinate outages with Owner and local fire service. Notify Owner/Owner’s representative at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.
- F. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system to make switchovers and connections. Notify Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Demolish and extend existing electrical work under provisions of this section.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Electrical Contractor is responsible for demolished electrical materials, and shall remove from the site and dispose properly or recycle.
- D. Remove abandoned wiring to source of supply.
- E. Remove exposed abandoned conduit. Cut conduit flush with walls and floors, and patch surfaces as required to match existing.
- F. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
- G. Disconnect and remove abandoned panelboards and distribution equipment.
- H. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- I. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- J. Discarded electrical components and lamps containing hazardous waste (i.e., mercury in fluorescent lamps) shall be disposed of as required by the State Laws and Local Ordinances regarding hazardous materials.
- K. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
- L. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.4 INSTALLATION

- A. Install relocated and replacement materials and equipment as shown.

END OF SECTION 26 05 01

SECTION 26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Wires and cables.
 - 2. Connectors.
 - 3. Lugs and pads.
- B. System Description:
 - 1. Provide wires, cables, connectors, lugs, strain reliefs, racking insulators for a complete and operational electrical system.

1.3 SUBMITTALS

- A. Provide product data for the following equipment:
 - 1. Wires.
 - 2. Cables.
 - 3. Connectors.
 - 4. Lugs.
 - 5. Splice Kits.
- B. Provide the insulation cable testing report in the project closeout documentation, refer to Closeout Requirements in the General Conditions portion of this specification.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Confirm to requirements of the CEC, latest adopted version with amendments by local Authority Having Jurisdiction (AHJ).
 - 2. Furnish products listed by UL or other testing firm acceptable to AHJ.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Wires and Cables: General Cable, Okonite, Southwire, or approved equal.
- B. Connectors: Burndy, IlSCO, Thomas & Betts, or approved equal.
- C. Wire connectors shall be minimum 75 degree centigrade rated and properly sized for the number of conductors being connected, terminated, spliced etc. All above grade connectors shall be solderless lug or plastic wire nut type, screw on, pressure cable type (wire nut or spring nut type), 600 Volt, 105-degree C, with skirt to cover all portions of stripped wires. Connector shall be U.L. rated for number and size of conductors being joined together as a splice.

- D. Splices:
1. Branch Circuit Splices: Ideal, Scotch-Lock, 3M, or approved.
 2. Feeder Splices: Compression barrel splice with two layers Scotch 23 and four layers of Scotch 33+ as vapor barrier.
 3. Screw Terminal Lugs.
 4. Kearney Split Bolt.

2.2 WIRES AND CABLES FOR LINE VOLTAGE SYSTEM AND CONTROLS.

- A. Wire and Cable Shall Be:
1. Copper, 600 volt rated throughout. Conductors 12AWG to 10AWG, solid or stranded. Conductors 8AWG and larger, stranded.
 2. Phase color to be consistent at all feeder terminations; A-B-C, top to bottom, left to right, front to back. Phasing tape shall be permitted on sizes #6 and larger.
 3. Color Code Conductors as Follows:

PHASE	208 VOLT	240 VOLT DELTA	480 VOLT
A	Black	Black	Brown
B	Red	Orange (High Leg)	Orange
C	Blue	Blue	Yellow
Neutral	White	White	White w/colored strip
Ground	Green	Green	Green
Isolated Ground	Green w/yellow trace	Green w/yellow trace	N/A
 4. All conductors shall be copper unless otherwise noted. Minimum size for individual conductors shall be #12 AWG unless otherwise noted. Sizes #8 AWG and larger shall be stranded conductor. Individual conductors shall be insulated with type, XHHW, THW, THHN/THWN 600- volt insulation unless otherwise noted. Control, signal, communication conductors shall be as dictated by the vendor of that equipment or as specified here-in. Proper insulation type shall be used for the proper environmental application (i.e., waterproof, wet location, plenum, temperature rated). If a condition exists where the application is uncertain, contact the Engineer for direction. Contractor is responsible to follow specific cabling requirements described in other sections of this specification relative to various communications and controls systems as well as the respective riser diagrams shown on plans. If a discrepancy occurs, communicate such discrepancy to the Architect and Engineer immediately for resolution.
 5. Insulation types THWN, THHN or XHHW. Minimum insulation rating of 90C for branch circuits.
 6. Refer to signal and communications specification sections for cable requirements.

2.3 CONNECTORS

- A. Copper Pads: Drilled and tapped for multiple conductor terminals.
- B. Lugs: Indent/compression type for use with stranded branch circuit or control conductors.
- C. Solid Conductor Branch Circuits: Spring connectors, wire nuts, for conductors 12 through 8AWG.

2.4 LUGS AND PADS

- A. Ampacity: Cross-sectional area of pad for multiple conductor terminations to match ampere rating of panelboard bus or equipment line terminals.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Installation: Conductors shall not be installed until after conduit systems are permanently in place. Use an approved non-hardening type wire pulling lubricant if lubricant is to be used. Maintain all conduits and wire pulls free from foreign material. If due to field conditions, more than a total of 300 degrees of bend are required; a pull box shall be furnished and installed for ease of installation. Said pull boxes must be sized and rated for the appropriate application and must remain easily accessible upon completion of the project (approval of the location shall be obtained from the Architect prior to installation). Show these pullboxes on the field record drawings. Conductors installed in underground raceways on site shall be duct sealed and taped where they exit the raceway to prevent the entrance of foreign material and moisture after the conductors are installed. Proper drainage shall be provided for underground pull and splice boxes.
- B. Insulation: Use proper insulation types where temperature and environment are a factor.
- C. Labeling: All conductors in panels, switchboards, terminal cabinets, vaults, pull boxes, and junction boxes shall be labeled with tape number markers indicating circuit number and identifying system. All labeling shall be permanent. See Section 26 05 53: Identification of Electrical Systems.
- D. All conductors, wiring, cable where installed below floor, slab or underground shall be considered wet locations, and shall be rated accordingly. Non-waterproof cabling is not allowed in any below grade or wet application.
- E. Cables routed together in cable tray shall be stacked, organized and tie wrapped together in a neat and workman like manner. Random cable routing is not acceptable.
- F. Cable and conductors routed through pull boxes and vaults shall be properly supported. Bend radius of cable or conductor shall not be less than six times the overall cable diameter.
- G. Wires and Cables:
 - 1. Conductor Installation:
 - a. Install conductors in raceways having adequate, code size cross-sectional area for wires indicated.
 - b. Install conductors with care to avoid damage to insulation.
 - c. Do not apply greater tension on conductors than recommended by manufacturer during installation.
 - d. Use of pulling compounds is permitted. Clean residue from exposed conductors and raceway entrances after conductor installation.
 - 2. Conductor Size and Quantity:
 - a. Install no conductors smaller than 12AWG unless otherwise shown (e.g. – Fire alarm and communications systems, as defined in their respective specifications sections and/or drawings).
 - b. Provide all required conductors for a fully operable system.
 - 3. Provide dedicated neutrals (one neutral conductor for each phase conductor). Exceptions may only be granted with Electrical Engineer approval.
 - 4. Conductors in Cabinets:
 - a. Cable and train all wires in panels and cabinets for power and control neatly and uniformly. Use plastic ties in panels and cabinets.
 - b. Tie and bundle feeder conductors in wireways of panelboards.
 - c. Hold conductors away from sharp metal edges.

3.2 FIELD QUALITY CONTROL

- A. Tests:
1. Test conductor insulation on feeders of 400 amp and greater for conformity with 1000 volt megohmmeter. Use Insulated Cable Engineers Association testing procedures. Minimum insulation resistance acceptable is 1 megohm for systems 600 volts and below.
 2. Test Report: Prepare a typed tabular report indicating the testing instrument, the feeder tested, amperage rating of the feeder, insulation type, voltage, the approximate length of the feeder, conduit type, and the measured resistance of the megohmmeter test. Submit report with operating and maintenance manual.

END OF SECTION 26 05 19

SECTION 26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Grounding and bonding requirements of electrical installations for personnel safety and to provide a low impedance path for possible ground fault currents as described in CEC Article 250.
 - 2. "Grounding electrode system" refers to all electrodes required by CEC, as well as including made, supplementary, lightning protection system and telecommunications system grounding electrodes.
 - 3. The terms "connect" and "bond" are used interchangeably in this specification and have the same meaning.
- B. Related Sections:
 - 1. Section 26 05 00: Common Work Results for Electrical.
 - 2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

- A. Equipment grounding conductors shall be UL 83 insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG and larger shall be permitted to be identified per CEC.
- B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes No. 10 AWG and smaller shall be ASTM B1 solid bare copper wire.
- C. Conductor sizes shall not be less than what is shown on the drawings and not less than required by the CEC, whichever is greater.

2.2 SPLICES AND TERMINATION COMPONENTS

- A. Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).

PART 3 EXECUTION

3.1 GENERAL

- A. Ground in accordance with the CEC, as shown on drawings, and as hereinafter specified.

- B. Equipment Grounding: Metallic structures (including ductwork and building steel), enclosures, fire sprinklers, plumbing piping, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be bonded and grounded.

3.2 INACCESSIBLE GROUNDING CONNECTIONS

- A. Make grounding connections which are buried or otherwise normally inaccessible (except connections for which periodic testing access is required) by exothermic weld.

3.3 SECONDARY EQUIPMENT AND CIRCUITS

- A. Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.
- B. Metallic Piping, Building Steel, and Supplemental Electrode(s):
 - 1. Provide a grounding electrode conductor sized per CEC between the service equipment ground bus and all metallic water and gas pipe systems, building steel, and supplemental or made electrodes. Jumper insulating joints in the metallic piping. All connections to electrodes shall be made with fittings that conform to UL 467.
 - 2. Provide a supplemental ground electrode and bond to the grounding electrode system.
- C. Service Disconnect: Provide a ground bar bolted to the enclosure with lugs for connecting the various grounding conductors.
- D. Conduit Systems:
 - 1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor sized per CEC.
 - 2. Nonmetallic conduit systems shall contain an equipment grounding conductor, except that non-metallic feeder conduits which carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment need not contain an equipment grounding conductor.
 - 3. Metal conduit containing only a grounding conductor, and which is provided for mechanical protection of the conductor, shall be bonded to that conductor at the entrance and exit from the conduit.
- E. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders, power and lighting branch circuits.
- F. Boxes, Cabinets, Enclosures, and Panelboards:
 - 1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes.
 - 2. Provide lugs in each box and enclosure for equipment grounding conductor termination.
 - 3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.
- G. Motors and Starters: Provide lugs in motor terminal box and starter housing or motor control center compartment to terminate equipment grounding conductors.
- H. Receptacles shall not be grounded through their mounting screws. Ground with a jumper from the receptacle green ground terminal to the device box ground screw and the branch circuit equipment grounding conductor.

- I. Ground lighting fixtures to the equipment grounding conductor of the wiring system when the green ground is provided; otherwise, ground the fixtures through the conduit systems. Fixtures connected with flexible conduit shall have a green ground wire included with the power wires from the fixture through the flexible conduit to the first outlet box.
- J. Fixed electrical appliances and equipment shall be provided with a ground lug for termination of the equipment grounding conductor.

3.4 CONDUCTIVE PIPING

- A. Bond all conductive piping systems, interior and exterior, to the building to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.

3.5 TELECOMMUNICATIONS SYSTEM

- A. Bond telecommunications system grounding equipment to the electrical grounding electrode system.

3.6 GROUND RESISTANCE

- A. Grounding system resistance to ground shall not exceed 15 ohms. Make necessary modifications or additions to the grounding electrode system for compliance without additional cost to the Owner. Final tests shall assure that this requirement is met and test results shall be submitted to the Owner with final close out documents.
- B. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in IEEE Standard 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.
- C. Below-grade connections shall be visually inspected by the IOR prior to backfilling. The Contractor shall notify the IOR 24 hours before the connections are ready for inspection.
- D. Furnish a copy of tests to Owner at completion of project.

END OF SECTION 26 05 26

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

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. Conduit supports.
 2. Formed steel channel.
 3. Spring steel clips.
 4. Sleeves.
 5. Mechanical sleeve seals.
 6. Firestopping relating to electrical work.
 7. Firestopping accessories.
 8. Equipment bases and supports.

1.3 REFERENCES

- A. Underwriters Laboratories Inc.:
 1. UL 263 - Fire Tests of Building Construction and Materials.
 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
 3. UL 1479 - Fire Tests of Through-Penetration Firestops.
 4. UL - Fire Resistance Directory.

1.4 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.5 PERFORMANCE REQUIREMENTS

- A. Firestopping: Conform to Building Code and UL for fire resistance ratings and surface burning characteristics.

1.6 SUBMITTALS

- A. Product Data:
 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.

1.7 QUALITY ASSURANCE

- A. Perform Work in accordance with the Building Code.

PART 2 - PRODUCTS

2.1 CONDUIT SUPPORTS

- A. Manufacturers:
 - 1. Allied Tube & Conduit Corp.
 - 2. Electroline Manufacturing Company
 - 3. O-Z Gedney Co.
 - 4. Appleton
- B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.
- C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- E. Conduit clamps - general purpose: One hole malleable iron for surface mounted conduits.
- F. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self locking.

2.2 FORMED STEEL CHANNEL

- A. Manufacturers:
 - 1. Allied Tube & Conduit Corp.
 - 2. B-Line Systems
 - 3. Midland Ross Corporation, Electrical Products Division
 - 4. Unistrut Corp.
- B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.3 SLEEVES

- A. Sleeves for raceway Through Non-fire Rated Floors: 18 gage galvanized steel.
- B. Sleeves for raceway Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage galvanized steel.
- C. Sleeves for raceway Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL Listed.
- D. Fire-stopping Insulation: Glass fiber type, non-combustible.

2.4 SPRING STEEL CLIPS

- A. Product Description: Mounting clamp, and screw.

2.5 MECHANICAL SLEEVE SEALS

- A. Manufacturers:
 - 1. Thunderline Link-Seal, Inc.
 - 2. NMP Corporation

- B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.6 FIRESTOPPING

- A. Manufacturers:
 - 1. Dow Corning Corp.
 - 2. Fire Trak Corp.
 - 3. Hilti Corp.
 - 4. International Protective Coating Corp.
 - 5. 3M fire Protection Products .
 - 6. Specified Technology, Inc.
- B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
 - 1. Silicone Firestopping Elastomeric Firestopping: Multiple component silicone elastomeric compound and compatible silicone sealant.
 - 2. Foam Firestopping Compounds: Multiple component foam compound.
 - 3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
 - 4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
 - 5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
 - 6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
 - 7. Firestop Pillows: Formed mineral fiber pillows.

2.7 FIRESTOPPING ACCESSORIES

- A. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- B. General:
 - 1. Furnish UL Listed products.
 - 2. Select products with rating not less than rating of wall or floor being penetrated.
- C. Non-Rated Surfaces:
 - 1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
 - 2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify openings are ready to receive sleeves.
- B. Verify openings are ready to receive firestopping.

3.2 INSTALLATION - HANGERS AND SUPPORTS

- A. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Provide precast inserts, expansion anchors, powder actuated anchors or preset inserts as required.
 - 2. Steel Structural Elements: Provide beam clamps, spring steel clips, steel ramset fasteners or welded fasteners as required.
 - 3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors as required.
 - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts or hollow wall fasteners as required.
 - 5. Solid Masonry Walls: Provide expansion anchors or preset inserts as required.
 - 6. Sheet Metal: Provide sheet metal screws.
 - 7. Wood Elements: Provide wood screws.

- B. Inserts:
 - 1. Install inserts for placement in concrete forms.
 - 2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over four (4) inches.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

- C. Install conduit and raceway support and spacing in accordance with CEC.

- D. Do not fasten supports to suspended ceiling support system, pipes, ducts, mechanical equipment, or conduit.

- E. Install multiple conduit runs on common hangers.

- F. Supports:
 - 1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
 - 2. Install surface mounted cabinets and panelboards with minimum of four anchors.
 - 3. In wet and damp locations install steel channel supports to stand cabinets and panelboards one (1) inch off wall.
 - 4. Support vertical conduit at every floor.

3.3 INSTALLATION - FIRESTOPPING

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.

- D. Compress fibered material to maximum 40 percent of its uncompressed size.

- E. Place intumescent coating in sufficient coats to achieve rating required.
- F. Remove dam material after firestopping material has cured.
- G. Fire Rated Surface:
 - 1. Seal opening at all rated floors and walls as follows:
 - a. Install sleeve through opening and extending beyond minimum of one (1) inch on both sides of building element.
 - b. Size sleeve allowing minimum of one (1) inch void between sleeve and building element.
 - c. Pack void with backing material.
 - d. Seal ends of sleeve with UL Listed fire resistive silicone compound to meet fire rating of structure penetrated.
 - 2. Where cable tray, bus, or conduit, penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.
- H. Non-Rated Surfaces:
 - 1. Seal opening through non-fire rated floors and walls as follows:
 - a. Install sleeve through opening and extending beyond minimum of one (1) inch on both sides of building element.
 - b. Size sleeve allowing minimum of one (1) inch void between sleeve and building element.
 - c. Install type of firestopping material recommended by manufacturer.
 - 2. Install escutcheons where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
 - 3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.

3.4 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Provide mechanical sleeve seals.
- B. Interior conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.
- C. Set sleeves in position in forms. Provide reinforcing around sleeves.
- D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- E. Extend sleeves through floors and walls one (1) inch above finished floor level. Caulk sleeves.

END OF SECTION 26 05 29

SECTION 26 05 33 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Conduit and fittings.
 - 2. Outlet boxes.
 - 3. Weatherproof outlet boxes.
 - 4. Junction and pull boxes.
 - 5. Floor boxes.
 - 6. Cabinets, termination cabinets.
 - 7. Gutters.
- B. Related Work:
 - 1. Installation of all wire, cable, conductor, boxes/gutters, pull ropes, fiber optic cable raceway, conduit, innerduct, cable sleeve and duct as described on the plans and/or as specified here-in. This scope shall include pathways to be installed underground onsite and offsite, underslab, above grade, both concealed and exposed, overhead concealed and exposed as appropriately applied. Raceways/boxes shall be installed in accordance with their intended and allowed uses and as specified here-in whichever is more restrictive. Size and capacity of all raceway/boxes shall be as specified here-in or as depicted on the drawings, but shall not be less than that required by code. Larger raceway sizes may be specified than code would permit. The specifications shall govern.
 - 2. Listed products for termination, coupling, extending, benching supports of raceways shall be used.
 - 3. Raceways/boxes described by this section shall include, but not be limited to, power for site utilities and lighting, site and building communications, controls, fire alarm, data system, power distribution, lighting, lighting controls, video, intercom, and other building low voltage/communications systems controls as may be required.
 - 4. Protection of and cleanliness of pathways and raceways must be assured during the construction process in order to eliminate the possibility of debris entering the conduit, duct, pathway resulting in decreased wire capacity and potential damage to installed conductors and cables.
 - 5. Pathways are shown in a diagrammatic way and are generally accurate as to routing, however, it is the Contractor's responsibility as a means and methods process to coordinate with all other trades that require space within a building. The Contractor shall obtain approval for installation of raceways routing through structural footings, retaining walls, columns, beams, purlins, grade beams, etc.
 - 6. It is the Contractor's responsibility to insure that all raceway and boxes systems penetrate fire assemblies and sound rated assemblies in an approved manner using the appropriate and listed products for the purpose.
 - 7. Minimum conduit size shall be 3/4" except if plan shows or code requires larger size. Exception: Use minimum 1" for underslab and below grade applications outside of building exterior walls.
 - 8. All electrical systems shall be installed in an approved conduit system. This shall include but not be limited to all systems described in Section B.3 above.

9. All line voltage wiring above-grade within the building shall be installed in metallic conduit.
10. Empty or future conduits shall be properly plugged with plastic caps or inserts with a 3/8" polyethylene pull rope. Plastic or "duct" tape will not be acceptable.
11. All low voltage systems including data, voice, intercom, fire alarm, public address, etc. shall be in raceways separated from line voltage cabling. Voice / Data and Direct Digital Control (DDC) systems for HVAC cabling shall be routed as specified in Section 27 41 16 and 23 09 23 respectively, and as recommended by EIA/TIA standards. It shall be the contractor's responsibility to provide raceway down walls to outlet boxes and to provide sleeves across inaccessible ceiling spaces.
12. Underground conduits entering building shall have the open end of conduit within building above the elevation of the conduit outside the building such that water cannot enter building through conduit. If such a condition exists, a pull box outside of building footprint shall be installed in conduit route before conduit enters building whereby top of pull box is below finish floor of building and moisture may exit box before entering building.
13. No single conduit run of any type shall exceed 300 degrees of radius bend from termination box to termination box.
14. Separate Raceway System - Provide a separate raceway system for each of the following systems installed. Do not combine different systems into a raceway or cable tray system, unless otherwise noted or allowed. Mechanical controls and raceway shall be provided by others in separate raceway from the below systems:
 - a. Fire Alarm.
 - b. Line Voltage.
 - c. All other low voltage systems provided by electrical contractor.
15. Spare, Future Conduits: Conduits labeled conduit only, spare, or for future use, shall be provided with a pullrope, capped at each end, labeled as spare with destination marked, and turned over to the Owner in an unused state. Contractor shall not utilize these conduits for the installation of cabling or conductors as part of this scope of work. Contractor to verify and install at no additional cost to the Owner, additional conduits as required for the installation of the systems being installed.
16. Outlet System: Provide electrical boxes and fittings as required for a complete installation. Including but not limited to outlet boxes, junction boxes, pull boxes, bushings, locknuts, covers and all other necessary components.
17. Code Compliance: Comply with CEC as applicable to construction and installation of electrical boxes and fittings and size boxes according to CEC 312, 314 and 366 except as noted otherwise.
18. Outlets to be flush mounted: Maintain integrity of insulation and vapor barrier. Unless otherwise noted, flush mount all outlet boxes.
19. Provide putty pads of proper type around outlet boxes and/or as detailed on plan to meet sound transmission restrictions and fire ratings of walls.

1.3 SUBMITTALS

- A. Provide Product Data for the Following Equipment:
 1. Conduit and fittings.
 2. Outlet boxes.
 3. Weatherproof outlet boxes.
 4. Junction and pull boxes.
 5. Floor boxes.
 6. Cabinets, termination cabinets.
 7. Gutters.
 8. Putty pads.
 9. Raceways

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Conform to requirements of the CEC, latest adopted version with amendments by local AHJs.
 - 2. Furnish products listed by UL or other independent and nationally recognized testing firm.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Heavy wall Rigid Non-Metallic Conduit, shall be PVC schedule 40 manufactured in accordance with NEMA Standard TC-2, UL-651 and WC 1094A specifications.
- B. Extra heavy wall non-metallic conduit, shall be PVC schedule 80 manufactured in accordance with NEMA Standard TC-2, UL-651 and WC 1094A specifications.
- C. Galvanized Rigid Steel (GRS) conduit shall be hot dipped galvanized, zinc coated and shall comply with Underwriters Laboratories UL-6, ANSI Specification C-80.1 and Federal Specification WW-C-581E.
- D. Electrical Metallic Tubing (EMT) shall be zinc coated, with a protective coating applied to the inside surface and shall comply with Underwriter Laboratories UL-797 ANSI Specification C-80.3 and Federal Specification WW-C-563A.
- E. Electrical Non-Metallic Tubing (ENT), shall be listed to requirements of U.L. 1653, in accordance with CEC Article 362, and meet requirements of BI National Standard CAN/CSA- C22.2 No. 227.1-U.L. 1653. ENT shall be rated for 90 degrees C conductors and shall be recognized for use in 2-hour fire resistance non-load bearing and load bearing wall assemblies. ENT shall be recognized for through-penetration firestop systems as classified to meet U.L. and ICC building codes. ENT shall only be allowed for data cabling systems and will not be permitted for Fire Alarm or line-voltage systems.
- F. Flexible Metal Conduit (FMC) shall be continuous wound reduced wall galvanized steel produced to UL standards.
- G. Liquid tight flexible metal conduit shall have a thermoplastic cover over a galvanized steel core containing an integral copper ground in sizes to 1 1/4" and shall be in compliance with UL standards and CEC Article 350.
- H. Wire basket tray shall be 12" wide with 4" side rails minimum unless otherwise noted. It shall be U.L. listed and use listed connectors, elbows, tees, etc. and be cut and installed using listed equipment. Material shall be zinc electroplated steel.
- I. Cable runway tray shall be 12" wide with 4" side rails minimum unless otherwise noted. It shall be U.L. listed and use listed connectors, elbows, tees, etc. Material shall be hollow steel with gray painted finish.
- J. Manufacturers:
 - 1. Outlet Boxes: Bowers, Raco, Orbit, Steel City or equal.
 - 2. Weatherproof Outlet Boxes: Bell, Red Dot, Carlon or equal.
 - 3. Floor Boxes: Wiremold/Walker, Hubbell, Steel City, or equal.
 - 4. Junction and Pull Boxes: Circle AW, Hoffman, Wireguard or equal.

5. Box Extension Adapter: Bell, Red Dot, Carlon or equal.
6. Conduit Fittings: O-Z Gedney, Thomas & Betts, Raco, Crouse Hinds, or equal.
7. Putty pads: 3M, Hilti, or equal.
8. Heavy wall rigid non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
9. Extra heavy wall non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
10. Galvanized Rigid Steel (GRS) conduit shall be hot dipped galvanized, zinc coated and shall comply with Underwriters Laboratories UL-6, ANSI Specification C-80.1 and Federal Specification WW-C-581E.
11. Electrical Metallic Tubing (EMT) shall be zinc coated, with a protective coating applied to the inside surface and shall comply with Underwriter Laboratories UL-797 ANSI Specification C-80.3 and Federal Specification WW-C-563A.
12. Electrical Non-Metallic Tubing (ENT), shall be listed to requirements of U.L. 1653, in accordance with CEC Article 362, and meet requirements of BI National Standard CAN/CSA-C22.2 No. 227.1-U.L. 1653. ENT shall be rated for 90 degrees C conductors and shall be recognized for use in 2-hour fire resistance non-load bearing and load bearing wall assemblies. ENT shall be recognized for through-penetration firestop systems as classified to meet U.L. and CBC building codes.
13. Flexible Metal Conduit (FMC), Alflex, American Flexible Conduit or equal.
14. Liquid tight flexible metal conduit, Anacanda (type UA), Electri-flex Liquatite or equal.
15. Floor Boxes, Single Gang, Walker/Wiremold 880 CS Series or approved equal.
16. Floor Boxes, Multiple Gang, Walker/Wiremold RFB Series or Walker Omnibox multi-service floor box with carpet plates, and/or water resistant device covers.
17. Masonry Boxes, outlets in concrete, Raco Series 690 or equal.
18. Wire basket tray, B-line, GS Metals, Cablofil, Chatsworth, FlexTray or equal.
19. Cable runway tray, B-line, CPI, Homaco, Chatsworth, FlexTray or equal.

2.2 OUTLET BOXES

- A. NEMA 1 gutter, junction and pull boxes shall be fabricated from code gage steel finished in grey enamel with screw cover fronts and concentric knockouts in all sides.
- B. NEMA 3R gutter, junction and pull boxes shall be fabricated from code gage galvanized steel with screw cover fronts and concentric knockouts in the bottom only. Any penetrations to the side, top or back shall be weatherproofed in an approved manner such as "MYERS" gasketed type hub or equal.
- C. Steel outlet boxes and plaster rings shall be galvanized rigid assemblies, either one piece pressed or factory welded construction containing the size and number of knockouts required. Steel outlet boxes shall be manufactured, sized and installed in accordance with CEC Article 314. Device Outlet: Installation of one or two devices at common location, minimum 4" square, minimum 1 1/2" deep. Single or 2 gang flush device plaster ring. Raco or equal.
- D. Luminaire Outlet: minimum 4" square with correct plaster ring depth, minimum 1 1/2" deep with 3/8" luminaire stud if required. Provide proper depth plaster ring on bracket outlets and on ceiling outlets.
- E. Construction: Provide galvanized steel interior outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices. Boxes shall be properly secured to the structure such that they are flush with the finish surface. Boxes shall be made structurally secure by means of the proper fastening devices.

- F. Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, plaster rings, luminaire studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.

2.3 JUNCTION AND PULL BOXES

- A. Construction: Provide galvanized sheet steel junction and pull boxes, with screw-on covers; of the type shape and size, to suit each respective location and installation; with welded seams and equipped with steel nuts, bolts, screws and washers.
- B. Location:
 - 1. Install junction boxes above accessible ceilings for drops into walls for receptacle outlets from overhead.
 - 2. Install junction boxes and pull boxes as required to facilitate the installation of conductors and limiting the accumulated angular sum of bends between boxes, cabinets and appliances to 300 degrees.
 - 3. Locations: Junction boxes shall be located only where necessary and only in equipment rooms, closets, and accessible attic and underfloor spaces. A horizontal distance of 24" shall separate outlet boxes on opposite sides of occupancy separation walls, fire-rated walls or partitions.
 - 4. Labeling: Junction box covers shall be marked with indelible ink indicated the circuit numbers passing through the box.

2.4 CONDUIT FITTINGS

- A. Requirements: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and plastic conduit bushings of the type and size to suit each respective use and installation.
- B. Steel boxes may allow for field knock-out modifications, but shall in all other ways conform to code requirements.

2.5 FLOOR BOXES - SINGLE GANG

- A. Construction: Deep cast iron fully adjustable before and after concrete pour with all required components for complete activation. Verify required components for application of service fittings, covers, monuments, and the like, attached to floor boxes.
- B. Activations:
 - 1. Flush: Provide brass duplex or single signal cover, hinged with set screw lock. Carpet or tile finish ring.
 - 2. Monuments: Provide stainless steel monuments with power receptacle or data grommet as noted.
 - 3. Coordinate specific application of systems as noted on Drawings.

2.6 FLOOR BOXES - MULTIPLE GANG

- A. Construction: Deep cast iron, fully adjustable before and after pour. Equal to Walker/Wiremold RFB Series or Walker Omnibox multi-service floor box with carpet plates, and/or water resistant device covers. Verify color. Partition for different power or signal applications. Provide required power receptacle devices and signal grommets or receptacles as noted. Flange type shall be compatible with floor covering for either carpet or vinyl as required and shall be brass type not polycarbonate.

- B. Floor mounted boxes shall be water tight and cast iron when installed in grade level concrete slab floor, fully adjustable with interior and exterior leveling screws. Receptacle flange shall be brass with a duplex lift lid. Flange type shall be compatible with floor type. Before installation, coordinate exact location with Architect.

2.7 PUTTY PADS

- A. Intumescent moldable firestop putty designed to protect electrical outletboxes.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Conduit systems listed below are for use in installations where they are permitted to be used by CEC and/or other occupancy restrictions. The below installation methods do not intend to suggest that these materials be installed in conflict with any applicable code. Special attention to applications shall be made in building types such as wet location, hazardous locations, assembly occupancy and multi-story, but not limited to these. Requirements which are more restrictive than the CEC may be called for by the drawings and / or these specifications. These requirements must be adhered to. The Electrical Contractor shall be responsible to use the proper conduit system for the application. Exposed conduit is not allowed below ceilings or above slab of floor, without prior approval from Electrical Engineer. All conduits shall be concealed except in electrical and telecommunication rooms or where shown to be surface mounted. Exposed conduit (where allowed) shall be run square and plumb with building lines in an approved manner. Support roofmount conduits, where allowed, with minimum 12" wide approved rooftop supports (B-Line Durablok, or approved equal) unless otherwise detailed in roof requirements or as specified in roofing specification. Strap conduits to blocks with proper sized conduit straps. Spacing of support shall be a minimum as provided for in the CEC. All exposed conduit mounted below 8' above finished grade shall be strapped at a minimum of 5' spacing.
- B. Electrical Non-Metallic Tubing (ENT) shall be installed in accordance with its listed application. Only listed cement shall be used for connectors, coupling, fittings requiring cement. Unless otherwise noted, ENT systems shall be color coded: Blue for branch and/or feeder power wiring, yellow for communications systems, and red for fire alarm and emergency power systems. Use only approved and listed accessories:
 1. Electrical Nonmetallic Tubing (ENT) is designed to replace EMT, flexible metal conduit or other raceway or cable systems, for installation in accordance with Article 362 of the National Electrical Code, Section 12-1500 of the CEC, other applicable sections of the Code, and local codes.
 2. Any ENT used shall be listed to the requirements of UL Standard UL 1653 in accordance with Article 362 of the NEC and Section 12-1500 of the CEC.
 3. Any ENT used shall meet the requirements of BI National Standard CAN/CSA-C22.2 No. 227.1-UL1653 and shall be Listed/Certified in accordance to the Electrical Codes.
 4. Carlon's ENT shall be installed per the technical assessment prepared by fire cause analysis for use in 1hour and 2-hour rated construction.
 5. Penetration of fire rated walls, floors or ceilings shall use Classified Through-Penetration Firestop Systems described in the current Underwriters Laboratories Fire Resistance Directory.
 6. Fittings and outlet boxes shall be designed for use with ENT shall be listed. All fittings, boxes and accessories shall be from one manufacturer.
 7. Only Carlon ENT Blue cement recommended specifically for use with ENT and rigid nonmetallic fittings shall be used.

8. Unless indicated differently on drawings, ENT systems shall be color coded: BLUE for branch and feeder circuit wiring, YELLOW for communications, and RED for fire alarm and emergency systems, or colors can designate different voltages.
 9. ENT, fittings, and accessories shall be manufactured by Carlon.
 10. ENT shall not be used or allowed in any application where not allowed by CEC Article 362.
- C. Non-Metallic Rigid Conduit shall be used in concrete slabs, below concrete slabs on grade, or underground outside of a building slab or foundation. Maintain minimum depth requirements and cover with appropriate fill material. Conduit shall be heavy wall Schedule 40 or 80, rigid PVC only. Rigid utility P&C duct shall not be used in any application. Properly sized grounding conductors shall be installed per CEC article 250, in all non-metallic conduit branch circuit and feeder runs. PVC conduit shall be formed or field bent only with the use of properly approved bending tools such as to not decrease the internal bore of the conduit. All conduits shall be cut square and reamed of burrs. Approved and compatible glue shall be used on all PVC fittings to attain watertight joints.
- D. Galvanized Rigid Steel (GRS) conduit shall be used where exposed less than 8'-0" above finished grade to 18" below finished grade and where subject to physical damage. Conduits shall be cut square and reamed to remove burrs and sharp edges. Strap conduit below 8' above grade at 5' intervals. Unless otherwise noted, threadless setscrew and threadless weathertight fittings may be used in lieu of threaded fittings. All threaded ends entering a junction box of any type shall require one locknut on the inside and one on the outside of the enclosure and be provided with a plastic bushing or grounding bushing where necessary for proper grounding. Where exposed to moisture, a watertight hub or other approved method shall be required. All conduits shall be stubbed up straight and uniform into junction boxes, panels, cabinets, etc., and shall be (GRS) properly supported and strapped. All GRS conduit located below grade, shall be tape wrapped.
- E. Electrical Metallic Tubing (EMT) shall be used as allowed by code and as permitted by this specification. It shall not be in contact with soil or the concrete slab on the ground floor of any structure. Connectors and couplings shall be steel insulated set screw type where installed in indoor dry locations not subject to moisture. Where the potential for moisture is present, compression type weathertight fittings are required. One hole conduit straps are permitted from 1/2" to 1" and two hole conduit straps are required for size 1 1/4" and larger. EMT shall not be allowed in areas subject to severe physical damage. Install copper ground wire sized per CEC 250-122 in all EMT conduits.
- F. Flexible conduit may be used where concealed in building construction or above dropped ceilings, but shall meet the following criteria: No individual circuit path from distribution panel to last device shall exceed a cumulative length of 6' of flexible conduit from start to end. Flexible conduit shall not exceed a total directional change of 270 bending degrees in any one run between conduit terminations. Squeeze type or Jake type steel flex fittings of a grounding type are required. Flexible conduit must be supported in accordance with CEC. Where exposed to the weather, moisture, or spray down flexible conduit shall be of the liquidtight type. Fittings shall be manufactured for use with liquidtight flexible conduit. All motor connections shall be made with liquidtight flex. Flexible conduit may not be used where exposed except for last 2' of equipment connection and unless otherwise noted or approved. A copper ground wire sized per CEC 250-122 shall be installed in all flexible conduit runs. Flexible conduit may not be used exposed. Weatherproof liquid tight conduit shall not be used at roof level for equipment connections with lengths exceeding 24" nor shall it be used to circumvent a rigid conduit system in a horizontal direction. Connect recessed lighting fixtures to conduit runs with a maximum of 6' of flexible metal conduit extending from junction box to fixture.

- G. Underground conduits and transition to above grade/slab shall be as follows:
1. PVC elbows 2" and smaller are allowed, or if top of elbow is minimum 18" BFG or below top of slab, otherwise GRS elbows are required.
 2. GRS risers are required from elbow below grade to equipment (device, outlet, panel, cabinet, etc.) above grade.
 3. GRS elbows/risers to be PVC coated or 10 MIL tape wrapped (1/2" lapped) to 3" above finish grade or top of slab.
- H. Conduit Supports: Conduit runs may be supported by one-hole and two-hole straps or supports as manufactured by Unistrut, Minerallac, Caddy or equals. Supports may be fastened by means of anchors, shields, beam clamps, toggle bolts, or other approved methods appropriate for the application and size of conduit. Pipe nailers (J-hooks) may only be used for 1" conduit and smaller and only in wood frame construction. Conduit support methods are subject to review by the engineer and authority having jurisdiction for adequacy. Installations deemed inadequate shall be corrected by the contractor at no cost to the Owner.
- I. Bends and offsets shall be made with approved tools for the type of conduit being utilized. Bends shall be made without kinking or destroying the smooth bore of the conduit. Parallel conduits shall be run straight and true with bends uniform and symmetrical. Minimum radii shall be per CEC 344-24.
- J. Conduit Stub-outs below grade shall be capped with plastic cap, and identified by placing a pull box marked with correctly identified utility such as "Elec", "Tel", etc. Dimension for exact location on field record drawings. Provide lids for proper field application (i.e. traffic, incidental, pedestrian).
- K. Conduit Seals - Where below grade conduits enter structure through slab or retaining wall of building or basement, seal the inside of each conduit as follows:
1. Provide damming material around conductors 3" into conduit. Polywater or equal.
 2. Fill 3" of conduit with 3M #2123 sealing compound.
 3. Wrap conductors where they exit the conduit with 3M #2229 "Scotch Seal" mastic tape. Lap tape to approximate diameter of the raceway and wrap outside of conduit opening with (minimum) one turn.
 4. Use conduit sealing bushings type CSB (O-Z/Gedney) or equal.
 5. Empty conduits shall be sealed with standard non-hardening duct seal compound and then capped to prevent entrance of moisture and gases and to meet fire resistance requirements.
 6. Provide cable drip loop minimum 12" high.
- L. Marker tape: Place marker tape at 12" below finish grade along and above buried conduits. Label tape "CAUTION: ELECTRICAL LINES BELOW" or similar wording.
- M. Electrical and communications systems raceways routed underground shall not occupy the same trench as plumbing utilities such as sewer, water, storm drain, gas or other wet or dry gaseous utility system. A minimum of 12" of undisturbed earth is required. Where utilities must cross in closer proximity to each other due to physical constraints, 6" minimum crossing distances are allowed.
- N. Conduits, routed below footings, slabs, grade beams, columns, and other structural elements shall be installed in strict compliance with structural details and criteria shown on structural plans. Clearances below structural elements and sleeves through structural elements must be carefully planned to avoid conflict and must be approved by the structural engineer if conflict arises.

- O. All conduit or raceways passing through fire rated walls, floors, or ceilings shall be installed with a listed penetration method which protects the opening to the same rating as the assembly and is non hardening.
- P. Cable runway shall be used in equipment rooms where shown on the plans. Ladder tray installations shall conform to the requirements of CEC Article 318. The contractor shall provide all mounting hardware, connectors and bracing as required and as recommended by the manufacturer for a complete system installation.
- Q. Wire basket tray shall be used in all concealed spaces (above ceiling spaces, under buildings in access tunnels, below raised floors, etc.) unless otherwise noted. Wire basket tray installations shall conform to the requirements of CEC Article 318. The contractor shall provide all mounting hardware, connectors and bracing as required and as recommended by the manufacturer for a complete system installation. All cutting and bending of wire basket tray shall be per the manufacturer's recommendation using tools designed for that purpose. Cable loading shall not exceed the listing of the system and its support.
- R. Location: Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.
- S. Anchoring: Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.
- T. Special Application: Provide weatherproof outlets for locations exposed to weather or moisture.
- U. Knockout Closures: Provide knockout closures to cap unused knockout holes where blanks have been removed.
- V. Mount outlet boxes, unless otherwise required by ADA, or noted on drawings, the following distances above the finished floor:
 - 1. Receptacles, Telephone, TV & Data outlets. (measured to bottom of outlet box): +15".
 - 2. Outlet above counter (measured to top of outlet box): +46".
 - 3. Control (light) Switches. (measured to top of outlet box): +48".
 - 4. Fire Alarm Manual Pull Stations, T-stats. (measured to top of outlet box): +48".
 - 5. Fire Alarm Visuals: the lower of +80" to bottom of lens, or 6" below ceiling.
 - 6. Other Outlets: As indicated in other sections of specifications or as detailed on drawings.
- W. Coordinate all electrical device locations with the architectural floor plan and interior and exterior elevations to prevent mounting devices within elements that they may conflict such as cabinetry, mirrors, planters, etc.
- X. Size outlet and junction boxes to minimum wire fill space requirements. Upsize box as required to allow ease of wire installation and device installation.
- Y. Outlet and junction boxes in fire rated walls shall be gauged and spaced so as not to exceed the maximum penetration allowed by the assembly without compromising the fire rating. If a conflict arises relative to a specific condition, the contractor shall follow the requirements of the fire authority and ask for guidance from the design team. At no time should a larger box be installed prior to resolution of conflict.

END OF SECTION 26 05 33

SECTION 26 05 53 IDENTIFICATION OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Nameplates and warning signs where specified herein and as shown on contract documents including the following:
 - a. Nameplates and warning signs permanently installed on all electrical equipment and devices including, but not limited to, the following items:
 - 1) Enclosures for transformers, switchboards, motor control, panels, pullboxes, cabinets, motors, generators, transfer switches.
 - 2) Enclosures for all separately enclosed devices including, but not limited to, disconnect switches, circuit breakers, contactors, time switches, control stations and relays, fire alarm panels and lighting control panel.
 - 3) Wall switches not within sight of outlet controlled.
 - 4) Special systems such as, but not limited to, telephone, fire alarm, warning and signal systems. Identification shall be at each equipment rack, terminal cabinet, control panel, annunciator and pullbox.
 - 5) Devices mounted within and part of equipment including circuit breakers, switches, control devices, control transformers, relays, indication devices and instruments.
 - 2. Conductor and Cable Identification.
- B. Related Sections:
 - 1. Section 26 05 00: Common Work Results For Electrical.
 - 2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.

PART 2 PRODUCTS

2.1 EQUIPMENT LABEL DESIGNATIONS

- A. Equipment labels indicating equipment designations both emergency and normal. Designation data per drawings or to be supplied with shop drawings approval.
- B. Panelboard labels showing panel designation, voltage, phase and source.
- C. Distribution panels, transformers, safety switches, transfer equipment, etc. Labels shall be per ANSI Z535.4 guidelines.

2.2 MATERIALS

- A. For Labels: Three layer laminated plastic or micarta with engraved white letters over black background.
- B. For Emergency Equipment: Use engraved white letters over red background.

- C. For Warning Signs: Minimum 18 gauge steel with red lettering on white porcelain enamel finish.
- D. Arc flash labels shall be provided as required by CEC Article 70E.
- E. Conductor tape number markers: TayMac MX4280 Series non-fading permanent adhesive.

2.3 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to the following:
 1. Panduit Corp.
 2. American Labelmark Co.
 3. Markal Corp.
 4. Calpico, Inc.
 5. Ideal Industries, Inc.

PART 3 EXECUTION

3.1 MOUNTING

- A. Equipment labels shall be mounted by self-tapping, threaded screws and bolts, or by rivets. Adhesive types are not acceptable unless specifically noted in this section.
- B. Conductor tape markers shall be consistently placed for ready conductor identification.

3.2 HEIGHTS ON LABELS

- A. Panelboards, Switchboards and Motor Control Centers and Special Systems Enclosures: 1/4" identify equipment designation; 1/8" identify voltage rating and source.
- B. Individual Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, and Motor Control Centers: 3/16" identify circuit and load served, including location of equipment.
- C. Enclosed Circuit Breakers, Enclosed Switches, and Motor Starters: 3/16" identify load served.
- D. Transformers: 3/16" identify equipment designation; 1/8" identify primary and secondary voltages, primary source and secondary load. Include location of primary source or secondary load if remote from transformer.

3.3 WARNING SIGNS

- A. Warning signs shall be permanently mounted with cadmium plated steel screws or nickel-plated brass bolts.
- B. Warning signs to read "DANGER - HIGH VOLTAGE", with letters 1 1/2" high, 3/16" stroke minimum.

- C. Provide warning sign on all doors or immediately next to door for equipment rooms, enclosures or closets containing equipment energized above 150 volts to ground as per CEC, and/or as directed by the Architect. For interior finish spaces and interior doors, signage shall be coordinated and approved with the Architect in advance of installation.
- D. Underground Warning Tape. Description: four (4) inch wide plastic tape, colored red with suitable warning legend describing buried electrical lines.

3.4 UNDERGROUND WARNING TAPE INSTALLATIONS:

- A. Install underground warning tape along length of each underground conduit, raceway, or cable six (6) to eight (8) inches below finished grade, directly above buried conduit, raceway, or cable. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.
- B. Install line marker for underground wiring, both direct buried and in raceway

3.5 PRINTED PANELBOARD DIRECTORY

- 1. Provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker for that panel, switchboard, or motor control center.
- 2. Panelboard directory shall include a legend indicating insulation color corresponding each phase and voltage in the building electrical system.
- 3. Copy in Owner's Manual.

3.6 ABOVE CEILING JUNCTION BOXES

- A. Labeling: Provide label on all above ceiling junction boxes.
 - 1. Provide permanent labeling with indelible black marker, in neat, legible print indicating the panelboard name, branch circuit number(s) and voltage of conductors within the junction box.

END OF SECTION 26 05 53

SECTION 26 27 26 WIRING DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Wiring devices.
- B. Related Sections:
 - 1. Section 26 05 00: Common Work Results for Electrical.
 - 2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.
 - 3. Section 26 05 26: Grounding and Bonding for Electrical Systems.
 - 4. Section 26 05 33: Raceway and Boxes for Electrical Systems.

PART 2 PRODUCTS

2.1 RECEPTACLES

- A. General - All receptacles shall be listed by Underwriters Laboratories, Inc.:
 - 1. Mounting straps shall be plated steel, with break-off plaster ears and shall include a self-grounding feature (this feature does not substitute for a grounding conductor terminated on grounding strap of device). Terminal screws shall be brass, brass plated or a copper alloy metal.
 - 2. Receptacles shall be of a screw terminal type, "pressure type quick wire" terminations are not allowed.
- B. Duplex receptacles shall be premium specification grade single phase, 20 ampere, 120 volts, 2-pole, 3-wire, and conform to the NEMA 5-20R configuration in NEMA WD 6. The duplex type shall have bussing break-off feature for two-circuit operation. The ungrounded pole of each receptacle shall be provided with a separate terminal:
 - 1. Wiring device color shall be standard white. Contractor to verify device color with Architect prior to procurement.
 - 2. Ground Fault Interrupter Duplex Receptacles - Shall be an integral unit suitable for mounting in a standard outlet box:
 - a. Ground fault interrupter shall be commercial grade and consist of a differential current transformer, solid state sensing circuitry and a circuit interrupter switch. It shall be rated for operation on a 60 Hz, 120 volt, 20-ampere branch circuit. Device shall meet CEC requirements. Device shall have a minimum nominal tripping time of 1/30th of a second. Devices shall meet UL 943.
- C. Receptacles; 20, 30 and 50 ampere, 250 volts: Shall be complete and match with appropriate cord grip plug. Devices shall meet UL 231.

- D. Weatherproof Receptacles: Shall consist of a listed weather resistant duplex receptacle, mounted in box with a gasketed, while in use weatherproof, cast metal cover plate and cap receptacle opening. The cap shall be permanently attached to the cover plate by a spring-hinged flap. Approved manufacturers: Intermatic WP10 Series, Thomas & Betts/Red Dot 2CK Series, or engineer approved equal.
- E. Approved receptacles are Hubbell HBL5352 Series, and Hubbell GF20, GFCI Series.

2.2 SWITCHES

- A. Toggle switches shall be totally enclosed tumbler type with bodies of phenolic compound. Toggle handles color to match receptacle device color unless otherwise specified. Approved toggle switch is Hubbell SB120:
 - 1. Shall be single unit toggle, butt contact, quiet AC type, heavy-duty general-purpose use with an integral self-grounding mounting strap with break-off plaster ears and be of a screw terminal type.
 - 2. Shall be color coded for current rating, listed by Underwriters Laboratories, Inc., and meet the requirements of NEMA WD 1, Heavy-Duty and UL20.
 - 3. Ratings:
 - a. 120 volt circuits: 20 amperes at 120-277 volts AC.
 - b. 277 volt circuits: 20 amperes at 277 volts AC.
 - 4. The switches shall be mounted on the strike plate side of doors.
 - 5. Incorporate barriers between switches with multi-gang outlet boxes where required by the CEC.
 - 6. All toggle switches shall be of the same manufacturer.
 - 7. Key lockable switches shall be Hubbell HBL122 Series.

2.3 WALL PLATES

- A. Wall plates for switches and receptacles shall be type 302 stainless steel.
- B. Standard NEMA design, so that products of different manufacturers will be interchangeable. Dimensions for openings in wall plates shall be accordance with NEMA WD1.
- C. For receptacles or switches ganged together, wall plates shall be a single ganged plate.
- D. Wall plates for data, telephone or other communication outlets shall be as specified in the associated specification.
- E. Surface mounted boxes, NEMA1, shall be industrial grade raised galvanized steel covers. In shop areas, all receptacles shall be dust proof and or waterproof where applicable.
- F. Waterproof device covers shall be cast iron, 4-corner screw type, for FS and FD type mounting. Device covers shall be zinc galvanized finish. Weatherproof covers shall be lockable.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the CEC, NECA "Standard of Installation", and as shown as on the drawings.

- B. Ground terminal of each receptacle shall be bonded to the outlet box with an approved green bonding jumper, and also be connected to the green equipment grounding conductor.
- C. General: Devices shall be of the type specified herein. All devices shall be installed with "pigtailed" leads from the outlet box. No device shall be used in the "feed through" application. Screw terminals shall be used to connect all devices to the circuit and shall be grounded by means of a ground wire where grounding terminals are provided in the device.
- D. Installation: Devices and plates shall be installed in a "plumb" condition and must be flush with the finish surface of the wall where boxes are recessed.
- E. Mounting heights: All control and convenience devices shall comply with California Code of Regulations Title 24 and ADA with respect to accessibility requirements. Mounting heights indicated on plans shall have precedence.
- F. Install switches with the off position down.
- G. Clean debris from outlet boxes.
- H. Provide extension rings as required to bring outlet boxes flush with finished surface or casework.
- I. Test each receptacle device for proper polarity.

END OF SECTION 26 27 26

SECTION 26 50 00 - LIGHTING

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 interior luminaires, lamps, ballasts, and accessories. Provide all luminaires complete with all new lamps, completely wired, controlled, and securely attached to supports.

1.3 SUBMITTALS

- A. Product Data: Submit dimensions, ratings, and performance data.
- B. Photometric data for each luminaire, lamp and ballast. Include indications of all options and accessories as well as finish color.
- C. Specification Review: A complete item by item, line by line specification review.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Provide luminaires listed by U.L.
 - 2. Luminaires installed in outdoor areas unprotected from weather to be U.L. Listed for wet locations.
 - 3. Insulated ceilings: Luminaires installed into insulated ceilings shall be U.L. Listed Type IC.
- B. Certification: Certify that fixtures submittal have trim compatible with ceilings being installed.
- C. Concrete for outdoor lighting poles foundations shall be provided per Section 03 30 00 - Concrete.

1.5 EXTRA MATERIALS

- A. Provide extra materials for Owners use. All parts shall packaged in suitable carton.
- B. Provide two (2) spare drivers for each fixture type. Deliver to Owner in original packaging.

PART 2 - PRODUCTS

2.1 LUMINAIRES

- A. Product Description: Complete luminaire assemblies, with features, options, and accessories as scheduled.
- B. All luminaires shall be new and of specification grade.
- C. Manufacturer nomenclature in fixture schedule or otherwise described on the Drawings is given only to show the general fixture series. Contractor shall provide fixture with all required accessories and mounting frame type.
- D. Wire guard at fixtures in mechanical, electrical, and high abuse areas.
- E. Acceptable Manufacturers:
 - 1. Lightolier
 - 2. Acuity
 - 3. Metalux
 - 4. Day-Brite
 - 5. Columbia
 - 6. HE Williams

2.2 LED LUMINAIRES

- A. Quality Assurance
 - 1. DOE Lighting Facts certified.
- B. LED Specifications
 - 1. Lumen maintenance of the LEDs has been tested in accordance with IESNA LM-80-08 reporting methodology.
 - 2. CRI:>82 minimum (general); >90 healthcare and retail.
 - 3. SDCM: <2.5 in linear pendants and linear recessed; <3.5 in discrete recessed.
 - 4. R9: .0 (general office/school environments); >50 in healthcare and retail environments.
 - 5. Outdoor luminaires to be rated at a minimum of 40° C.
- C. Lumen Maintenance
 - 1. Minimum L70 at 50K hours based on TM-21 Addendum A Lifetime report at an ambient temperature of 25° C, outdoors at an ambient temperature of 40° C.
- D. Thermal Testing
 - 1. ISTM testing in accordance to UL 1598-2008.
- E. Driver
 - 1. 0-10V enabled.
 - 2. Output Class 2 rated.
 - 3. Dimming range: 5-100%.
 - 4. Constant current.
 - 5. THD @ max load: <20%.
 - 6. Power factor: >0.95
 - 7. Environment protection rating: UL Damp and dry.

8. Approbations: certified to UL8750, UL1310, UL935, CSA-C22.2 No. 250.13-12, CSA 22.2 No. 223.
 9. ROHS Compliant
- F. Fixture photometry
1. Conducted by a NVLAP accredited testing lab with IESNA LM 79-08.
 2. System flux measured in delivered lumens.
- G. Warranty
1. 5 year total system warranty.

2.3 EMERGENCY BATTERY PACKS

- A. Provide Emergi-Lite FPSIU series, or approved equal, battery pack for fluorescent fixtures designated to have emergency battery back-up.
- B. Fixture shall include lighted push button test switch installed in visible, accessible location adjacent to fixture.
- C. Provide unswitched alternating current power source per manufacturer's instructions.
- D. Provide connection to local switch where indicated on drawings, connect such that fixture can be controlled on/off from local switch without discharge of battery.
- E. For fixtures designated to have emergency battery pack and be on a contactor controlled circuit, provide unswitched alternating current source ahead of contactor and wiring as required to allow automatic on/off control from the contactor without discharge of battery and local on/off switching where indicated.
- F. Battery pack shall provide 1100 lumen output for 90 minutes per 2'x4' light fixture.
- G. Provide integral battery pack for all exit signs where emergency generator power is not available. Battery pack shall provide minimum of 90 minutes output.

2.4 DOWNLIGHT FIXTURES

- A. Provide recessed light fixtures with trim rings compatible with the ceiling material where fixture is to be installed.

2.5 EXIT SIGNS

- A. Exit signs shall meet visibility requirements and be listed per UL 924 "Emergency Lighting and Power Equipment". Also shall meet Federal, State and Local Codes.
- B. Chevron Directional Indicator: Provide Chevron per NFPA 101 Section 5-10.4.1.2.
- C. Product Description:
 1. LED Exit Sign:
 - a. Provide exit sign with Light Emitting Diodes (LED) illuminance source. Cover LED with diffuser.
- D. Housing: Diecast aluminum with stencil face and matte white paint finish.

- E. Input Voltage: 120/277 volt, dual input voltage.
- F. EPA Energy Star Label.
- G. Wire Guards: Install wire guard on all exit signs installed in gyms, lockers rooms, and athletic wing.

PART 3 - EXECUTION

3.1 EXISTING WORK

- A. Disconnect and remove abandoned luminaires, lamps, poles and accessories.
- B. Extend existing luminaire installation using materials and methods compatible with existing installation, or as specified.
- C. Clean and repair existing luminaires to remain or to be reinstalled.

3.2 INSTALLATION

- A. General: All luminaires shall have proper supports.
- B. Install suspended luminaires using pendants supported from swivel hangers.
- C. Locate recessed ceiling luminaires as indicated on Drawings.
- D. Install surface mounted ceiling luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- E. Chain Hung: Unless otherwise indicated all fluorescent fixtures in Mechanical, Electrical and Elevator Equipment Rooms shall be chain hung. Verify exact mounting height with Architect before installing fixtures. Provide pendant hangers when equipment room has fire-resistive ceiling.
- F. Suspended Ceilings:
 - 1. Provide means of support for luminaires per CEC 410-36. T-bar clips shall be installed on the luminaire and shall be field secured to the inverted ceiling tees so that the luminaire is securely fastened to the ceiling system framing members.
 - 2. Ceiling tiles shall not bear the weight of luminaires. Surface mount luminaires, recessed downlights, light track, exit signs, etc. shall be supported by proper frames or other attachment to main ceiling system grid or building structure above ceiling.
 - 3. Luminaires shall be centered in ceiling tile.
 - 4. Luminaire shall have flange or trim ring for closure of ceiling cutout or opening.
 - 5. Fire-rated Ceiling Assembly: For Luminaires to be flush-mounted into a fire-rated ceiling or surface mounted to a fire-rated ceiling, install with independent, secure support. Raceway, cable assemblies, boxes and fittings located above a fire-rated floor/ceiling or roof ceiling assembly shall not be secured to, or supported by, the ceiling assembly including the ceiling support wires. Provide an independent means of secure support. Independent support wires shall be distinguishable by color, tagging, or other effective means from those that are part of the fire-rated design.

- G. Verify weights and recommended mounting methods of all luminaires with manufacturers. Furnish and install supports. Luminaires weighing more than 30 pounds shall be supported independently of the outlet box.

3.3 LOCATIONS

- A. Luminaires shown on the Electrical Drawings represent general arrangements only. Refer to Architectural Drawings and to Architect on jobsite for more exact locations. Coordinate location with all other trades before installation. Coordinate all light fixtures in Mechanical Rooms with the final installed piping and ductwork layouts. Adjust fixture mounting height and location if required so that light output is not obstructed by piping and ductwork.

3.4 AIMING AND ADJUSTMENT

- A. General: All adjustable lighting units shall be aimed, focused, and locked by the Contractor under the supervision of the Architect/Owner. All aiming and adjusting shall be carried out after the entire installation is complete.

3.5 LAMPS

- A. Clean all lamps after installation.

3.6 CLEANING

- A. Lens: Clean lenses of all luminaires after space is finished and prior to project acceptance.

END OF SECTION 26 50 00

SECTION 27 00 00 - BASIC MATERIALS AND METHODS

PART 1 – GENERAL

1.01 RELATED WORK

- A. The entire drawing and specification package apply to the work specified in the telecommunications sections of the specifications and shall be complied with in every respect. The Contract Documents are comprised of the drawings and specifications. The Contractor shall examine these Contract Documents, and coordinate required work indicated in each.

1.02 SCOPE OF WORK

- A. The work covered by the specifications includes furnishing materials, labor, transportation, tools, permits, fees, utilities, and incidentals necessary for the complete installation of work required in the Contract Drawings.
- B. It is the intent of the Contract Documents to provide an extension of the existing installed systems interfaced with new systems, complete in every respect.
- C. The Contractor shall be responsible for coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with the existing site conditions, details of the work and the working conditions, and verify dimensions in the field. The Contractor shall advise the Engineer of any discrepancy prior to bidding. The submission of bids shall be deemed evidence of the Contractor's site visit; coordination of existing conditions and include consideration for existing conditions.
- D. Provide line-by-line specification review for each Division 27 section annotated to certify compliance or deviation.

1.03 DRAWINGS AND SPECIFICATIONS

- A. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.
- B. If variations or departures from the drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Engineer for review. No departures shall be made without prior written acceptance of the Engineer.
- C. Should the drawings or specifications disagree in themselves or with their counterpart, the better quality or greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Engineer in writing, shall be performed or furnished. In case the specifications should not fully agree with the Schedules, the latter shall govern. Figures indicated on drawings govern scale measurements and large-scale details govern small scale drawings.
- D. Items specifically mentioned in the specifications but not shown on the drawings and/or items shown on the drawings but not specifically mentioned in the specifications shall be installed by the Contractor under the appropriate section of work as if they were both specified and shown.

1.04 CODES AND STANDARDS

- A. All work shall comply with the applicable articles of the National Electrical Code, the National Electrical Safety Code, the National Fire Codes (published by National Fire Protection Association), and City Codes and Ordinances, as well as any other authorities that may have lawful jurisdiction pertaining to the work specified. None of the terms or provisions of this specification shall be construed as waiving any of the rules, regulations, or requirements of these authorities.
- B. Contractor is responsible for knowledge and application of current versions of all applicable standards and codes. In cases where listed standards and codes have been updated, Contractor shall adhere to the most recent revisions, including all relevant changes or addenda at the time of installation.
- C. ANSI/TIA:
1. ANSI/TIA-526-7-A (July 2015) Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
 2. TIA-526.2-A (July 2015) Effective Transmitter Output Power Coupled into Single-Mode Fiber Optic Cable - Adoption of IEC 61280-1-1 ed. 2 Part 1-1: Test Procedures for General Communication Subsystems – Transmitter Output Optical Power Measurement for Single-Mode Optical Fiber Cable
 3. ANSI/TIA-4994 (March 2015) Standard for Sustainable Information Communications Technology
 4. ANSI/TIA-526-14-C (April 2015) Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
 5. ANSI/TIA-568.0-D (September 2015) Generic B (supersedes TIA-568-C.0 and TIA-568-C-1)
 6. ANSI/TIA-568.1-D (September 2015) Commercial Building Telecommunications Infrastructure Standard (supersedes ANSI/TIA-C.1)ANSI/TIA-568.2-D (September 2018) Balanced Twisted-Pair Telecommunications Cabling and Components Standard
 7. ANSI/TIA-568.3-D (June 2016) Optical Fiber Cabling Components Standard
 8. ANSI/TIA-568.4-D (August 2020) Broadband Coaxial Cabling Components Standard
 9. ANSI/TIA-569-E (May 2019) Telecommunications Pathways and Spaces
 10. ANSI/TIA-598-D (July 2014) Optical Fiber Cable Color Coding
 11. ANSI/TIA-570-C (August 2012) Residential Telecommunications Infrastructure Standard
 12. ANSI/TIA-606-C (June 2017) Administration Standard for Telecommunications Infrastructure
 13. ANSI/TIA-607-D (July 2019) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
 14. ANSI/TIA-758-B (March 2012) Customer-Owned Outside Plant Telecommunication Infrastructure Standard
 15. ANSI/TIA-862-B (February 2016) Structured Cabling Infrastructure Standard for Intelligent Building Systems
 16. ANSI/TIA-942-B (July 2017) Telecommunications Infrastructure Standard for Data Centers
 17. ANSI/TIA-1005-A (May 2012) Telecommunications Infrastructure Standard for Industrial Premises
 18. ANSI/TIA-1005-A-1 (January 2015) Telecommunications Infrastructure Standard for Industrial Premises, Addendum 1- M12-8 X-Coding Connector - Addendum to TIA-1005-A
 19. ANSI/TIA-1183 (August 2012) Measurement Methods and Test Fixtures for Balun-Less Measurements of Balanced Components and Systems

20. ANSI/TIA-1183-1 (January 2016) Measurement Methods and Test Fixtures for Balun-Less Measurements of Balanced Components and Systems, Extending Frequency Capabilities to 2 GHz - Addendum to TIA-1183
 21. TIA-1152 (November 2016) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
 22. TIA-1179-A (September 2017) Healthcare Facility Telecommunications Infrastructure Standard
 23. ANSI/TIA-4966 (May 2014) Telecommunications Infrastructure Standard for Educational Facilities
 24. TIA-455-104-B (February 2016) FOTP 104- Fiber Optic Cable Cyclic Flexing Test (supersedes TIA-455-104-A)
 25. TIA/EIA-455-25-D (February 2016) FOTP-25 Impact Testing of Optical Fiber Cables
 26. TIA-604-18 (November 2015) FOCIS 18 Fiber Optic Connector Intermateability Standard – Type MPO-16
 27. TIA-604-5-E (November 2015) FOCIS 5 Fiber Optic Connector Intermateability Standard- Type MPO
 28. TIA-5017 (March 2016) Telecommunications Physical Network Security Standard
 29. TIA-TSB-155-A (Reaffirmed 10-6-2014) Guidelines for the Assessment and Mitigation of Installed Category 6 Cabling to Support 10GBASE-T
 30. TSB-184 (July 2009) Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling
 31. TSB-4979 (August 2013) Practical Considerations for Implementation of Multimode Launch Conditions in the Field
 32. TSB-190 (June 2011) Guidelines on Shared Pathways and Shared Sheaths
 33. TIA-TSB-162-A (November 2013) Telecommunications Cabling Guidelines for Wireless Access Points
 34. TSB-5018 (July 2016) Structured Cabling Infrastructure Guidelines to support Distributed Antenna Systems
 35. TIA-492AAAE (June 2016) Detail Specification for 50- μm Core Diameter/125- μm Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers with Laser-Optimized Bandwidth Characteristics Specified for Wavelength Division Multiplexing
 36. TIA-492AAAB-A (November 2009) Detail specification for 50- μm core diameter/125- μm cladding diameter class 1a graded-index multimode optical fibers
 37. TIA-455-243 (March 2010) FOTP-243 Polarization-mode Dispersion Measurement for Installed Single-mode Optical Fibers by Wavelength-scanning OTDR and States-of-Polarization Analysis
 38. TSB-172-A (February 2013) Higher Data Rate Multimode Fiber Transmission Techniques
- D. ISO/IEC:
1. ISO/IEC TR 11801-99-01 Information technology – Generic cabling for customer premises: Guidance for balanced cabling in support of at least 40 GBit/s data transmission: Parts 1 and 2
 2. ISO/IEC TR 29106 AMD 1 Information technology -- Generic cabling -- Introduction to the MICE environmental classification
 3. ISO/IEC 24764 AMD 1 Information technology – Generic cabling for data centers
 4. ISO/IEC 11801 AMD 1 AMD 2 Information technology – Generic cabling for customer premises
 5. ISO/IEC 15018 AMD 1 Information technology – Generic cabling for homes
 6. ISO/IEC 24702 AMD 1 Information technology – Generic cabling – Industrial premises
 7. ISO/IEC 14763-1 AMD 1 Information technology – Implementation and operation of customer premises cabling – Part 1: Administration
 8. ISO/IEC 14763-2 Information technology – Implementation and operation of customer premises cabling – Part 2: Planning and installation

9. ISO/IEC 14763-2-1 Information technology – Implementation and operation of customer premises cabling – Part 2-1: Planning and installation – Identifiers within administration systems
 10. ISO/IEC 14763-3 Ed 2.0 Information technology -- Implementation and operation of customer premises cabling -- Part 3: Testing of optical fiber cabling
 11. ISO/IEC TR 24704 Information technology – Customer premises cabling for wireless access points
 12. ISO/IEC TR 24750 Information technology – Assessment and mitigation of installed balanced cabling channels in order to support 10GBASE-T
 13. ISO/IEC TR 29125 IT Telecommunications cabling requirements for remote powering of terminal equipment
- E. BICSI – Building Industry Consultative Services International – Published Standards
1. ANSI/BICSI 001-2009, Information Transport Systems Design Standard for K-12 Educational Institutions
 2. ANSI/BICSI 002-2014, Data Center Design and Implementation Best Practices
 3. ANSI/BICSI-003-2014 Building Information Modeling (BIM) Practices for Information Technology Systems
 4. BICSI 004-2012, Information Technology Division Systems Design and Implementation Best Practices for Healthcare Institutions and Facilities
 5. ANSI/BICSI 005-2016, Electronic Safety and Security (ESS) System Design and Implementation Best Practices
 6. BICSI 006-2015 Distributed Antenna System (DAS) Design and Implementation Best Practices
 7. ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
 8. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
 9. BICSI – Building Industry Consultative Services International – Manuals
 10. Telecommunications Distribution Methods Manual, 14th Edition (2020)
 11. Information Transport Systems Installation Methods Manual (ITSIMM), 6th Edition
 12. Outside Plant Design Reference Manual, 5th Edition
 13. BICSI's ICT Terminology Handbook, Version 1.0
 14. Telecommunications Project Management Manual (TPMM), 1st edition
 15. Telecommunications Project Management Reference Document (TPMRD), 2nd Edition
 16. BICSI's Special ICT Design Considerations, Version 1.0
 17. Essentials of Bonding and Grounding, Version 1.0
- F. National Electric Codes
1. National Electrical Safety Code (NESC) (IEEE C2-2012)
 2. NFPA 70-2020, National Electrical Code® (NEC®)
 3. ANSI/IEEE C2-207, National Electrical Safety Code®
 4. National Electrical Code (NEC) (NFPA 70)
 5. NFPA 72 National Fire Alarm and Signaling Code
- G. ASHRAE
1. ASHRAE Standard 90.4P, Energy Standard for Data Centers and Telecommunications Buildings
- H. OSHA Standards and Regulations – all applicable
- I. Local Codes and Standards – all applicable

- J. Anywhere cabling standards conflict with one another or with electrical or safety codes, Contractor shall defer to the NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either.
- K. Knowledge and execution of applicable standards and codes is the sole responsibility of the Contractor.
- L. Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor's expense.
- M. In any instance where these Specifications call for materials for construction of a better quality or larger size than required by the codes, the provisions of these Specifications shall take precedence. The codes shall govern in case of direct conflict between the Codes and the Drawings.

1.05 EXISTING UTILITIES

- A. The Contract Documents reflect the general location and routing for all telecommunications services known to exist on this project.

1.06 BUILDING CONSTRUCTION AND LAYOUT OF WORK

- A. General: It shall be the responsibility of the Contractor to consult the Engineering Drawings and Details so as to thoroughly familiarize himself with the type and quality of construction to be provided on this project.
- B. The drawings are diagrammatic in nature and do not show every connection in detail or every line or conduit in its exact location. These details are subject to the requirements of all codes and ordinances as well as all structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases unless specifically noted or indicated to be exposed. Work shall be installed to avoid crippling of structural members; therefore, inserts to accommodate conduit hangers shall be set before concrete is poured, and proper openings through floors, walls, beams, etc. shall be provided as hereinafter specified or as otherwise indicated or required before concrete is poured. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted.
- C. The approximate location of equipment items is indicated on the drawings. Exact locations are to be determined by coordination of dimensions from approved equipment submittals and site-verified field measurements and will in all cases be subject to the approval of the Engineer. The Engineer reserves the right to make any reasonable changes in the indicated locations prior to installation for no additional cost.
- D. In areas of existing special ceiling construction the removal and restoration must be carefully planned such that the existing condition of the ceilings is maintained. It may be necessary for the Contractor to procure a Subcontractor familiar with this work to achieve this requirement.

PART 2 – PRODUCTS

2.01 GENERAL MATERIALS AND EQUIPMENT REQUIREMENTS

- A. Materials, in general, shall conform to the National Electrical Code requirements and shall be listed, inspected, and approved by the Underwriters Laboratories and shall bear the UL label where labeling service is available. The label or listing of the Underwriters Laboratories, Inc. will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this listing, the Contractor may submit a statement from a nationally recognized, adequately equipped testing agency, indicating that the items have been tested in accordance with required procedures, and that the materials and equipment comply with all Contract requirements.

2.02 STANDARD PRODUCTS

- A. Materials and equipment shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications and shall essentially duplicate materials and equipment that have been in satisfactory use at least two (2) years prior to bid opening. Where custom or special items are required, these shall be fully described using drawings, material lists, etc., which fully describe in detail the item proposed for use on this project.

2.03 MANUFACTURER'S INSTRUCTIONS

- A. The Contractor is responsible for furnishing the proper telecommunications equipment and/or material and for seeing it is installed as intended by the manufacturer. The Contractor shall, wherever necessary, request advice and supervisory assistance from equipment manufacturers as required for the proper installation, operation, or start-up. The Contractor shall notify the Engineer in writing of any conflict between the Contract Documents and the manufacturer's recommendations and shall obtain from the Engineer instructions/direction before proceeding with the work. The Contractor shall pay for all costs resulting from deficiencies created by installation not in accordance with the manufacturer's recommendations or the instructions of the Engineer.

2.04 RUST PREVENTION

- A. Metallic materials shall be protected against corrosion. Exposed metallic parts of equipment exposed to the elements shall be given a rust inhibiting treatment and standard finish by the manufacturer. Components such as boxes, bodies, fittings, guards, and miscellaneous parts shall be protected in accordance with the ASTM A123 or A153, except where other equivalent protective treatment is specifically approved in writing.

2.05 STORAGE AT SITE

- A. The Contractor shall not receive material or equipment at the job site until ready for installation or until there is suitable space provided to properly protect equipment from rust, weather, humidity, dust, or physical damage.

2.06 CONDITION OF MATERIALS

- A. All materials required for the installation of the telecommunications systems shall be new and unused. Any material or equipment damaged in transit from the factory, during delivery to premises, while in storage on premises, while being erected and installed, or while being tested, until time of final acceptance, shall be replaced by this Contractor without extra cost to Owner.

2.07 NAMEPLATES

- A. Factory assembled components and equipment shall be provided with embossed nameplates, securely attached to the equipment with rivets or screws. Nameplates will have information required to specifically identify the equipment in the future such as the manufacturer's name, address, catalog number, serial number, etc. All data on nameplates shall be legible at the time of final inspection.

PART 3 – EXECUTION

3.01 ACCEPTABLE MANUFACTURERS

- A. The specifications contain the names of manufacturers which are considered acceptable based on the quality of the product.
- B. Where acceptable manufacturers are listed, only products of those manufacturers may be provided. Additionally, the product must meet all the detailed requirements of the specifications.
- C. If no manufacturer's name is mentioned, the Contractor shall provide equipment and material which meet the specifications.
- D. The drawings represent the manufacturer's equipment scheduled. The listing of acceptable manufacturers in the specifications is not intended to imply that equipment of these other manufacturers will fit in the space provided or have the same electrical, structural, or other requirements as the equipment scheduled. The Contractor must ensure that the equipment provided will meet all project requirements prior to submitting data on that equipment.

3.02 SPACE AND EQUIPMENT ARRANGEMENT

- A. Equipment and components shall be installed in a manner to permit access to parts requiring service. Telecommunications equipment shall be installed in such a manner as to allow removal for service without disassembly of adjacent equipment.
- B. Large equipment or apparatus which is to be installed in the building, and which is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly protected from damage.
- C. Equipment shall have working clearances as required by applicable codes and standards.

3.03 SUBMITTAL AND REVIEW OF MATERIALS

- A. After the Contract is awarded, but prior to proceeding with the Work, the Contractor shall obtain, check, certify, and submit complete Shop Drawings and Brochures from Manufacturers, Suppliers, Vendors, etc., for all materials and equipment specified herein. Submit Shop Drawings and Brochures in sufficient time so as not to impede the progress of work. Three weeks will be required for the processing of Shop Drawings and Brochures in the Engineer's office, exclusive of transmittal time. This time shall be considered by the Contractor when scheduling submittal data. After the Contract is awarded, the Contractor will advise the Engineer in writing of the schedule for submission of shop drawings and product data and the persons authorized to sign submittal data on behalf of the Company.

- B. The Engineer's review of Shop Drawings and Brochures shall not relieve the Contractor of the responsibility for dimensions, errors that may be contained therein, or deviations from Contract Document requirements. It shall be clearly understood that the Engineer's noting some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings, the requirements of the Contract Documents shall govern and are not waived or superseded in any way by the submittal data review.
- C. Before submission of Shop Drawings and Brochures, the Contractor shall certify that each Shop Drawing and each item of material or equipment complies with the Contract Documents for this Project. Such certification shall be made by the Owner, a Partner, a Corporate Officer of the Contractor, or by a person duly authorized to sign for the Contractor. Unless so certified, Shop Drawings and/or Brochures will be returned for resubmittal. Certifications shall be in the form of rubber stamp impressions or typed letter which states:

I hereby certify that this Shop Drawing and/or brochure and the equipment and material shown on this Shop Drawing and/or Brochure complies in all aspects (except as noted*) with the requirements of the Contract Documents for this Project. I further certify that all data shown herein as to performance, dimensions, construction, materials, and other pertinent items are true and correct.

Name of Contractor _____

Signed _____

Position _____

Date _____

*Refer to exception requirements herein.

- D. Each Shop Drawing shall indicate in the lower right-hand corner and each Brochure shall indicate on the front cover the following: Title of the Sheet or Brochure; name and location of the building; names of the Engineer, Contractor, Manufacturer, Supplier, Vendor, etc., the date of submittal; and the date of each correction and revision. As far as is practical, each Shop Drawing and/or Brochure shall bear a cross-reference note to the sheet number or numbers of the Contract Drawings and Specifications showing the same work. Shop Drawings and Brochures shall be prepared as follows:

1. Shop Drawings: Drawings shall be newly prepared and not reproduced from the Contract Documents, drawn to a scale that can be easily read and shall contain sufficient plans, elevations, sections, and isometrics to clearly describe the items in question. Drawings shall be prepared by a draftsman skilled in this type of work. All equipment layouts and similar Shop Drawings shall be drawn to at least 1/4-inch = 1'-0" scale.
2. All Shop Drawings shall indicate the equipment actually purchased. The elevation, location, support points, load imposed on the structure at support and anchor points, shall be indicated. All beam penetrations and slab penetrations shall be indicated and sized and shall be coordinated. All Design Drawing space allocations shall be maintained, such as ceiling height, chase walls, equipment room size, etc., unless proper written authorization is required from the Engineer to change them. All associated equipment shall be coordinated and clearly shown on the Shop Drawings.

3. Brochures: Brochures submitted to the Engineer shall be published by the Manufacturers and shall contain complete and detailed engineering and dimensional information to show that the equipment will fit into the allotted space.
 4. Brochures submitted shall contain only information which is relevant to the particular equipment or materials to be furnished. Do not submit catalogs that describe several different items other than those items to be used unless all irrelevant information is marked out or relevant information is clearly marked.
- E. The submittal format shall follow the Specifications format with a submittal required for each required section. The submittal shall be contained in a three-ring hard back binder. Copies of each submittal shall be three-hole punched and arranged (or folded if required) for the Engineer's filing convenience. Provide one copy of updated TABLE OF CONTENTS and progressive-tabbed index sheets also for the Engineer's filing convenience.
- F. Submittal data for each section must be complete. Partial submittals will not be reviewed. To the greatest extent possible all sections shall be submitted with the first submission. No more than three additional submissions will be allowed to complete the submittal package.
- G. Unless a greater number is indicated within Division One of these specifications, submit six (6) copies of all Brochures for review. Submit one (1) reproducible and one (1) blueprint of shop drawings for review. Comments will be made on the reproducible to facilitate copying.
- H. Any submittal that is disapproved must be resubmitted within two (2) weeks following notification of such disapproval. If no satisfactory material is submitted within the two-week period, the Engineer reserves the right to require the Contractor to furnish items exactly as described in the Contract Documents.
- I. No allowances will be made for submittals which are not made in a timely fashion or which are turned down because they do not meet the specifications. Should delivery problems arise due to the above, affecting the completion time of the project, the Contractor will furnish and install acceptable alternates until the proper materials arrive and then replace the alternate materials with the approved materials, all at no cost to the Owner. If the Contractor is not able to furnish an acceptable alternate until the proper materials arrive, he will assume all costs for furnishing and installing all alternates as directed by the Engineer and/or will pay a suitable penalty for the inconvenience experienced by the Owner. This penalty will be set by the Owner based on the particular circumstances.

3.04 SUPERVISION

- A. A competent certified foreman or superintendent, approved by the Engineer, shall be maintained at the project site to receive instructions and to act for the Contractor. Once this superintendent has been approved, no change shall be made without approval of the Owner or his authorized representative. The Owner and his authorized representative shall have the right to observe the work at any time. The Contractor shall have a representative present when his work is being observed, and he shall give assistance as required.

3.05 CUTTING AND PATCHING

- A. Where it is necessary to cut through walls, floors, or ceilings to permit installation of work under this section of the Contract, or to repair any defects that may appear, up to the expiration of guarantee period, such cutting shall be done under the supervision of the Engineer. The Contractor shall not be permitted to cut or modify any structural members without the written permission of the Engineer.
- B. Patching of all openings and repairing of any damage to the work of other trades occasioned by cutting operations or occasioned by the failure of any part of work installed under this Contract, shall be performed by the trade whose work is involved, and shall be paid for by the Contractor.
- C. Openings cut through exterior walls or roofs shall be provided with suitable covers to protect the property or materials involved. Openings cut through walls below grade shall be properly protected to prevent entrance of water or other foreign elements. Openings cut between fire zones or plenums shall be sealed to maintain the fire integrity of the wall or floor. Conduits and cable tray through plenum wall shall be sealed using materials complying with UL 1479, NEC 300-21, and NEC 800-3(C), and shall be UL classified.

3.06 HOISTING, SCAFFOLDING, AND TRANSPORTATION

- A. Provide hoisting and scaffolding facilities as required to set materials and equipment in place.

3.07 CLEANING

- A. The Contractor shall at all times keep the premises free from accumulations of waste material or rubbish. Debris shall be removed from the site and from any street or alley adjacent to the site.
- B. At completion of the project, the Contractor shall remove all tools, scaffolding, and surplus materials. Contractor shall leave the area "broom clean". Before final acceptance, vacuum all panels, cabinets, racks, and other equipment enclosures. Wipe clean all fixture lenses and reflectors, all panelboard and switchboard interior and exterior surfaces, being careful to remove all stray paint, construction materials, dust, and particles. Touch-up all marred surfaces to restore existing conditions to those provided by the manufacturer.

3.08 CONDUIT SLEEVES

- A. Where conduits pass through walls or floors not on fill, galvanized sheet metal sleeves shall be provided and shall be sealed to prevent air and noise transmission. In walls, they shall be flush with each finished surface. In pipe chases, they shall extend 1-1/2 inches above floor slab and be cemented in a watertight manner. Size of these sleeves shall be at least 1/2 inch greater than outside diameter of the conduit.
- B. For conduits passing through outside walls, provide and install galvanized steel sleeves having an inside diameter at least 4 inches greater than the outside diameter of contained conduit. Where these occur in walls having a waterproof coating applied, the sleeves shall have welded flanges to build into waterproofing. When conduits are installed, the annular space between pipe and sleeve shall be effectively sealed, using shredded lead hammered in place or an approved mastic sealer.
- C. Pipe and duct sleeves, pitch pockets, and flashings compatible with the roofing installation shall be provided for roof penetrations.

3.09 GROUNDING

- A. Ground buses shall be provided in each Telecommunications room by Division 16 Contractor unless noted on Contract Drawings.
- B. Telecommunications grounding system shall be a single point grounding from the building entrance electrical ground to each Telecommunications room. This Grounding system shall be provided by Division 16 Contractor unless notes on Contract Drawings.
- C. All Conduit systems, cabinets' racks, cable trays, protector blocks, SCTP patch panels and/or miscellaneous equipment, etc. shall be grounded by being connected to the common telecommunications grounding system. The conductors shall be a # 6awg solid with a green jacket

3.10 RECEDENCE OF WORK

- 1. This Contract includes many different systems furnished and installed by different trades. All trades shall coordinate their work with that of all other trades so that it may be installed in the most direct and workmanlike manner without hindering or handicapping other trades.

3.11 RECORD DRAWINGS

- A. The Contractor shall keep a set of Drawings on the job, noting daily all changes made in these Drawings in connection with the final installation, including exact dimensioned locations of all new and uncovered existing active and inactive utilities outside the building, and shall turn over a clean, neatly marked set of mylar reproducible Drawings showing "as-installed" work to the Engineer for delivery to the Owner. All underground utilities, services, and systems shall be accurately located by the Contractor and dimensioned on the "as-installed" Drawings.

3.12 OPERATING AND MAINTENANCE MANUAL

- A. The Contractor shall furnish indexed operating and maintenance manuals with complete technical data for each system, piece of equipment, and material installed under this Contract.
- B. Two (2) copies of the manual, bound in hardback binders or an approved equivalent, shall be provided. One copy shall be completed and delivered to the Engineer prior to the time that system and equipment tests are performed. The second copy shall be delivered prior to final acceptance.
 - 1. Provide one (1) operation and Maintenance manual for each building. Provide one (1) as-built floor plan and one CD for each building.
- C. The manual shall include the following information
 - 1. Manufacturer's installation instructions.
 - 2. Manufacturer's local representative and/or distributor's name and address.
 - 3. Manufacturer's operating and maintenance instructions.
 - 4. Manufacturer's internal wiring diagrams.
 - 5. Contractor's installation wiring diagrams.
 - 6. Replacement part number listings and descriptions.
 - 7. Framed operating instructions, when required, in individual Specification sections.
 - 8. Warranties and guarantees.

9. Provide an approved submittal at the front of each section.
- D. The manuals shall be identified on the cover as "Operating and Maintenance Manual" with additional cover display of the name and location of project, the Owner, the Engineers, the General Contractor, and the Subcontractors installing equipment represented in the brochure.
- E. The manual shall have a Table of Contents and shall be grouped in sections according to the sections of Division 27. Each section shall have a copy of the pages of the Specifications covered within the section. Sections shall be organized as follows:
 1. Each section in the manual shall identify the grouping of all literature required for the system or equipment included.
 2. The contents of each section shall be arranged in the following sequence: First, the approved engineering submittals with complete performance and technical data; second, the manufacturer's installation brochure; third, the manufacturer's operating and maintenance brochure; fourth, the manufacturer's installation wiring diagram; fifth, the Contractor's field wiring diagram, if different; and sixth, the manufacturer's brochure listing replacement part numbers and description.
 3. Provide a concluding section entitled, "Warranties and Guarantees", for all equipment, etc.

3.13 EXISTING FACILITIES

1. The Contractor shall be responsible for loss or damage to the existing facilities and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices and receive written permission from the Owner to enter existing areas. Before beginning work in existing areas, the Contractor shall make necessary arrangements and perform other services required for the care, protection, and in-service maintenance of all electrical, communication, plumbing, heating, air condition, and ventilating services for new and existing facilities. The Contractor shall erect temporary barricades with necessary safety devices to protect personnel from injury, removing all such temporary protection upon completion of the work.
2. The Contractor shall provide temporary or new services to existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.
3. Where existing construction is removed to provide working and extension access to existing utilities, the Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air condition ductwork, and equipment, etc. to provide this access and shall reinstall same upon completion of work.
4. Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed, the Contractor shall remove and reinstall in locations approved by the Engineer all devices required for the operation of the electrical systems installed in the existing construction. This is to include, but is not limited to, temperature control system devices, electrical switches, relays, fixtures, piping, conduit, etc.

3.14 DEMOLITION AND RELOCATION

1. The Contractor shall modify, remove, and relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain as directed by the Owner. Materials and items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to the approval of the Owner. The Contractor may substitute new materials and items of like design and quality in lieu of materials and items to be relocated, if approved by the Owner.
2. All items scheduled for relocation and/or reuse shall be inspected by the Contractor and the Owner or his authorized representative. A written report of the condition of each item shall be made and provided to the Engineer. Where items scheduled for relocation and/or reuse are considered unsuitable for reuse, the Contractor shall so notify the Engineer and await reinstallation instructions before proceeding with removal. Items damaged in reinstallation shall be repaired or replaced by the Contractor as directed by the Owner at not additional cost to the Owner or the Engineer.
3. All items which are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean, repair, and provide all new materials, fittings, and appurtenances required to complete the relocation and to restore the items to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.
4. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points as indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied off or connections into the existing facilities in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities which must remain in operation during the construction period shall not be interrupted without prior specific written approval of the Engineer.

3.15 OUTAGES

1. Outages of services as required by the project will be permitted, but only at a time approved by the Owner. The Contractor shall notify the Owner in writing two (2) weeks in advance of the requested outage in order to schedule required outages. No outages shall be taken unless written approval has first been received from the Owner. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the Contract amount.

END OF SECTION

SECTION 27 10 00 – CATEGORY 6A STRUCTURED CABLING SYSTEM (SCS)

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 RELATED WORK

26 5 00 – GROUNDING AND BONDING

26 05 29 – ELECTRICAL HANGERS AND SUPPORTS

26 05 33 – RACEWAY AND BOXES

1.3 DESCRIPTION

- A. Summary of Work:
1. Provide a complete and tested extension of the existing Category CAT6 cable distribution system for data interconnections (Local Area Network). The data distribution system shall include fully terminated unshielded twisted pair cables, raceways, conduit, UTP termination devices, data communications outlets, patch panels, patch cables, network racks, and other incidental and miscellaneous premises wiring system hardware as required for a complete and usable system. The installation shall comply with all applicable codes and standards in effect at the job site and as indicated in the Drawings and Specifications.

1.4 QUALITY ASSURANCE

- A. Acceptable manufacturers:
1. The equipment/products described herein and furnished per these specifications shall be the product of one manufacturer. All references to model numbers and other detailed descriptive data is intended to establish standards of design performance, and quality, as required
 2. The approved manufacturers shall provide a complete Category 6 solution with a 25-year performance warranty.
 3. Acceptable product connectivity and cable shall be Uniprise by CommScope. Only the manufacturers listed in this paragraph will be accepted.
 4. All products shall be Category 6 compliant. NO EXCEPTIONS.
- B. Installer Qualifications:
1. The Data Cable System Installer shall be licensed and shall meet all applicable regulations of the Department of Labor insofar as they apply to this type of system. The proposer shall be a firm normally employed in the low voltage and data cabling industry and shall provide a reference list of ten (10) similar size, Category 6, projects and contact names confirming successful Category 6 premises wiring system installations.
 2. The SCS Installer shall be a certified CommScope Uniprise and in good standing in the Partner Program, local area, integrator and must be able to provide the manufacturer's maximum available warranty on the entire SCS. The contractor's certification must have been obtained and held within 75 miles of the project's location.
 3. The installing contractor must have a full-time employed RCDD (Registered Communications Distribution Designer) on staff. Current RCDD certification shall be provided in the product submittals.

4. All individuals installing the SCS must be employees of the certified installer and at least 25% of the installing staff shall have undergone a training class given by the manufacturer. Current certification indicating the successful completion of the training course shall be available upon request at the project and submitted in the contractor's product submittals.
 5. The proposing contractor and the installing contractor must be the same company. No subcontractor to the proposing SCS contractor will be allowed for any portion of the SCS scope of work.
- C. Pre-Construction Meeting:
1. The successful Contractor shall attend a mandatory pre-construction meeting with the project's consultant and individuals deemed necessary by the Owner's representative prior to the start of the work. No SCS work shall begin prior to this meeting.
- D. Acceptance:
1. The Owner's representative reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.
- E. Warranty:
1. The selected system installer shall be a CommScope Uniprise, certified contractor and hold current certification. Contractor shall provide an end-to-end performance warranty of not less than twenty (25) years on all products installed. The proposer shall provide current certification documentation. The performance warranty shall be issued by the manufacturer and shall warrant that ALL Category 6 cable links have been tested bi-directionally (end to end) using a Level 2 tester, per TSB-67, and that all test results conform to the most current TIA/EIA-568-C and/or TSB-67 Link values.
 2. The warranty will also cover multimode fiber optic cabling. Performance testing shall be conducted in accordance with ANSI/EIA/TIA-526-14 Standard, method B.
 3. The warranty will stipulate that all products used in this installation meet the prescribed mechanical and transmission specifications for such products as described in ISO/IEC 11801, ANSI/TIA/EIA-568-A, or EN 50173. Quality and workmanship evaluation shall be solely by the Owner/Designer and designated representatives.

1.5 REGULATORY REQUIREMENTS

- A. Standards: All work shall be performed in accordance with the latest revisions of the following standards and codes:
1. Latest Local Codes and Amendments
 2. 2014 National Electrical Code
- B. Other References:
1. TIA/EIA-568-C – Commercial Building Telecommunications Wiring Standard
 2. EIA/TIA-569 – Commercial Building Standard for Telecommunication Pathways and Spaces.
 3. TIA/EIA-606 – The Administration Standard for the Telecommunications Infrastructure of Commercial Building.
 4. TIA/EIA-607 – Commercial Building Grounding and Bonding Requirements for Telecommunications.
 5. EIA/TIA 455-A – Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices and Other Fiber Optic Components.
 6. TIA/EIA TSB 67 – Transmission Performance Specification for Field Testing of Unshielded Twisted-Pair Cabling Systems.
 7. TIA/EIA TSB 72 – Centralized Optical Fiber Cabling Guidelines
 8. ISO/IEC 11801 – Generic Cabling Standard
 9. EN 50173 – Generic Cabling Standards for Customer Premises

10. ANSI/EIA/TIA 526-14 – Optical Power Loss Measurements of Installed Multimode Fiber Cable Plan.

- C. Governing Codes and Conflicts: If the requirements of these specifications or the Project Drawings exceed those of the governing codes and regulations, then the requirements of these specifications and the Drawings shall govern. However, nothing in the Drawings or Specifications shall be construed to permit work not conforming to all governing codes, regulations, and manufacturer installation requirements.

1.6 ABBREVIATIONS

- A. The following abbreviations are used in this document:
1. DC Direct Current
 2. IDF Intermediate Distribution Frame
 3. MDF Main Distribution Frame
 4. PBX Private Branch Exchange
 5. UTP Unshielded Twisted Pair

1.7 SUBMITTALS

- A. Project Initiation:
1. Within fourteen (14) days of Notice to Proceed, the data network system installer shall furnish the following in a single consolidated submittal:
 - a. Permits: The Contractor shall obtain all required permits and provide copies to the Owner/Architect/Engineer.
 - b. Product Literature: Complete manufacturer's product literature for all cable, patch panels, cross-connect blocks, cable supports, cable labels, outlet devices, and other products to be used in the installation. In addition, whenever substitutions for recommended products are made, samples (when requested by the Owner/Designer) and the manufacturer's supporting documentation demonstrating compatibility with other related products shall be included. The submittal shall have some type of distinguishing marker or pointer to indicated what specific product is to be provided
 - c. Construction Schedule: A time-scaled Construction Schedule, using PERT/CPM, indicating general project deadlines and specific dates relating to the installation of the cable distribution system.
 - d. Testing: Proposed Contractor Category 6 UTP cable test result forms, fiber optic cable test result forms and a list of instrumentation to be used for systems testing.
 - e. Specification Compliance: A letter shall be provided stating, by section and subsection, that the SCS installer complies with the ENTIRE specification section. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. NO DEVIATIONS SHALL BE ACCEPTABLE UNTIL THEY HAVE BEEN ACCEPTED BY THE PROJECT'S TECHNOLOGY CONSULTANT.
 - f. Certifications: The contractor shall submit all of the following certifications and the certifications must contain dates which are valid from the date of proposal and not expire any sooner than 12 months after substantial completion of the project.
 - 1) BICSI RCDD Certification: This certification must be held by an on-staff, full-time employee of the SCS installer. The holder must be staffed out of the office that is located within 75 miles of the project.
 - 2) Proposed Manufacturer's Strategic Partner Certification: This certification have been obtained by the SCS installer's office that is located within 75 miles of the project and shall be a company certification, not and individual certification.

- 3) Proposed Manufacturer's Installer Certification: This certification must be held by at least 25% of the, on-site, staff and be made available at the site if requested by the owner, architect, and/or project's technology consultant.
- 4) Fiber Optic Technician Certification: This certification must be held by the on-staff/on-site individual that is supervising the fiber optic installation and performing the fiber optic terminations and testing.

B. Shop Drawings:

1. Submit the following items, for Owner review and approval, within twenty-eight (28) days of notice to proceed:
 - a. Proposed circuit routing and circuit grouping plan prepared by a BICSI certified RCDD (Registered Communications Distribution Designer). The RCDD certification must be current. Identifiable, separate routing shall be shown for both the station cabling and the MDF-to-IDF tie cabling.
 - b. In addition to the cable routing, the submitted drawings shall indicate the following, even if the following is expected to be provided by the project's electrical or general contractor:
 - 1) Location of wall penetrations (all penetrations shall be sleeved and contain protective bushings at both ends)
 - 2) Location of sleeved wall pass-thru
 - 3) Size of sleeve at each location installed
 - 4) Quantity of cable passing through each sleeve
 - 5) Location of drops in each room (quantity or labeling of drops are not required in the submittal plans. Labeling shall be provided in the closeout plans and quantities shall be as per the contract documents, addendums, and issued changes. Each drop shall be labeled for the type of outlet that it is)
 - 6) Conduit routing, size, quantity, and stub-up locations for all floor mounted outlets.
2. Drawing Compliance: A letter shall be provided stating that the SCS installer complies with the ENTIRE project drawing, including all general, keyed, and notes to contractor. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. NO DEVIATIONS SHALL BE ACCEPTABLE UNTIL THEY HAVE BEEN ACCEPTED BY THE PROJECT'S TECHNOLOGY CONSULTANT.

C. Close-out Procedures:

1. Two (2) copies of the following documents shall be delivered to the building owner's representative at the time of system acceptance. The close out submittals shall include:
 - a. Inspection and Test Reports: During the course of the Project, the Contractor shall maintain an adequate inspection system to ensure that the materials supplied and the work performed, conform to contract requirements. The Contractor shall provide written documentation that indicates that materials acceptance testing was conducted as specified. The Contractor shall also provide documentation, which indicates that all cable termination testing was completed and that all irregularities were corrected prior to job completion.
 - b. Provide complete test reports for all cabling and devices that comprise system as outlined in this document.
 - c. Include the Name, address, and telephone of the authorized factory representative with a 24-hour emergency service number.
 - d. The manual shall also include Manufacturer's data sheets and installation manuals/instructions for all equipment installed, a list of recommended spare parts.
 - e. Generic or typical owner's instruction and operation manual shall not be acceptable to fulfill this requirement.
 - f. An up-to-date record ("as-built") set of approved shop drawing prints that have been revised to show each and every change made to the structure cabling system from the original approved shop drawings. Drawings shall consist of a scaled plan of each

- building showing the placement of each individual item of the technical cabling system equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.
- g. As-built Drawings shall include cable pathways, camera locations with correct labeling and MDF/IDF locations. The as-built drawings shall be prepared using AutoCad 2013 or later. Provide the Owner with electronic versions of the As-Builts on (2) 8GB thumb drives.
 - h. All drawings must reflect point to point wiring, device address and programmed characteristics as verified in the presence of the engineer and/or the end user unless device addressing is electronically generated, and automatically graphically self-documented by the system.
 - i. A copy of the manufacturer's warranty on the installed system.
 - j. Any keys to cabinets and/or equipment and special maintenance tools required to repair, maintain, or service the system.
 - k. Operating and Maintenance Instructions for all devices within the system. These instructions shall reflect any changes made during the course of construction, and shall be provided to the Owner, for their use, in a three-ring binder labeled with the project name and description. (4 copies)
 - l. Upon completion of the work and at a time designated by the Architect or owner, provide formal training sessions for the Owner's operating personnel to include location, operation, and maintenance of all included systems and equipment. Minimum amount of training time shall be at least 4 hours.
 - m. One (1) 30" x 42" laminated floor plan sheets illustrating technology drops and cable designation. Contractor shall provide one complete floor plan sheet for each telecommunications room (MDF or IDF)

PART 2 - PRODUCTS

2.1 GENERAL

- A. Installation: The cabling shall be installed per requirements of the manufacturer and the Project Documents utilizing materials meeting all applicable TIA/EIA standards. The Contractor is responsible for providing all incidental and/or miscellaneous hardware not explicitly specified below as required for a complete and operational system.
- B. Materials: Materials shall be as listed or shall be approved equivalent products of other manufacturers meeting the intent and quality level of the TIA/EIA specifications. All approved equivalent products will be published by addendum ten days prior to proposal for Architect/Engineer to review.
- C. Testing: All installed cabling shall be tested 100% good after installation by the Contractor. All final test results shall be delivered to owner at completion of project. Refer to closeout requirements listed under section 1.5.
- D. Ratings: All products shall be new and brought to the job site in the original manufacturer's packaging. Electrical components (including innerduct) shall bear the Underwriter's Laboratories label. All communications cable shall bear flammability testing ratings as follows:
 - 1. CM Communications Cable
 - 2. CMP Plenum Rated Communications Cable
 - 3. CMR Riser-Rated Communications Cable
- E. Initial Cable Inspection: The Contractor shall inspect all cable prior to installation to verify that it is identified properly on the reel identification label, that it is of the proper gauge, containing the correct number of pairs, etc. Note any buckling of the jacket that would indicate possible problems. Damaged cable or any other components failing to meet specifications shall not be used in the installation.

- F. Cable Lubricants: Lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit.
 - 1. Approved Products
 - a. Twisted-pair cable:
 - 1) Dyna-Blue
 - 2) American Polywater
- G. Fire Wall Sealant: Any penetration through firewalls (including those in sleeves) will be resealed with an Underwriter Laboratories (UL) approved sealant.
 - 1. Approved Products
 - a. 3M
 - b. Pre-approved equal
- H. All Category 6 cables and data drops on the entire project provided shall be colored blue

2.2 DATA CLOSET (MDF/IDF) CATEGORY 6 TERMINATION HARDWARE

- A. Equipment Racks/Cabinets:
 - 1. Existing
 - a. Located in Building 7 Room 20
- B. Category 6 Patch Panels:
 - 1. The data station cable shall be terminated on RJ45 patch panels with circuit board construction, T568B terminations. Patch panels shall be 19-inch rack mountable. Workstation patch panels shall terminate all workstation communications outlets. Furnish units that adhere to the performance requirements TIA/EIA-568A standards.
 - 2. Approved Products:
 - a. Existing CommScope Category 6 Patch Panels 24 Port 760207274 | CPP-UDDM-M-1U-24
 - b. Commscope Category 6 Modular Jack 760237782 | UNJ600-OR
 - c. provide cable support bars at the back of all patch panels to provide additional support at rear of rack and panels.
- C. Cable Management Panels
 - 1. Provide cable management panels as required for vertical cable management. Provide vertical wire management on ends and in between all racks on entire project. All vertical cable managers on the entire project shall be 10" wide management. Horizontal not to be used.
 - 2. Approved Products
 - a. Provide Velcro straps for cable dressing in MDF/IDF rack.
- D. Network Rack Patch Cables:
 - 1. Cabling Contractor shall provide district with (1) – 6' Category 6 patch cable for each data drop on entire project. These cables will provide connectivity from the front of the network patch panels to the network equipment provided by district upon move-in. The patch cables are to be terminated properly with RJ-45 connections on each end with the proper pin-out assignments per project configuration.
 - 2. Approved Products: CommScope 6' Category 6 Patch Cable
 - a. BLUE - UC1BBB2 | UC1BBB2-0ZF003

2.3 FIBER OPTIC PRODUCTS

- A. Fiber Optic Cable shall be UL listed type OFNP (unless noted otherwise):
 - 1. Provide (2) 6 ft OM2 Fiber Optic Patch Cables

- B. Fiber Optic Patch Panels
 - 1. Existing enclosure LC type connectors shall be utilized. Patch panels is 19" rack mounted. Provide all termination accessories, fiber patch cords, enclosures, and test for a complete extension of the fiber optic distribution system.
 - 2. Approved Products (for MDF/IDF locations):
 - a. Existing 2U Fiber Shelf with adapters
- C. Connectors
 - 1. Optical Fiber Connectors shall be LC Duplex type connectors.

2.4 STATION WIRING

- A. Wire: The data and voice wire provided for all outlets shall be (Category 6) Plenum-Rated unshielded twisted pair, four-pair, 24 AWG solid copper conductor, meeting the intent and quality level of the TIA/EIA-568-A Commercial Building Wiring Standard. Refer to floor plan and data outlet legend for number of active data ports to specified faceplates.
 - 1. Approved Products: For all voice and data connections: CommScope
 - a. BLUE UN874043014/10 | CS37P BLU C6 4/23 U/UTP CPK 1KFT
- B. Testing: The Category 6 four-pair UTP cable must be UL Performance Level tested. Each 1000-foot spool must be individually tested with test results affixed to the spool. All cable must be provided on new 1000-foot spools. NO "SHORTS" WILL BE ALLOWED. IF SHORTS ARE DISCOVERED, THE CONTRACTOR WILL BE REQUIRED TO UNINSTALL ALL CABLE ON THE ENTIRE PROJECT AND INSTALL NEW CABLE AT NO ADDITIONAL COST TO THE OWNER.
- C. Rating: Cable installed in conduit shall be non-plenum rated. Cable not installed in conduit shall be plenum rated if installed in plenum ceiling space, non plenum rated otherwise.
- D. Provide 10 feet service loop at all headend locations properly supported above ceiling. Provide 3' service loop at each workstation outlet properly supported above ceiling. All workstation service loops shall be made in figure eight configurations, no exceptions.
- E. All cable shall be bundled with Velcro from patch panel to outlet. Velcro shall be rated for plenum space.

2.5 STATION HARDWARE

- A. Flush Mount Jacks: Flush mount jacks shall be high quality Category 6 RJ45 modular jacks with circuit board construction and IDC style or 110-style wire, T568B terminations. Jacks shall meet EIA/TIA TSB40 recommendations for Category 6 connecting hardware.
 - 1. Approved Products – Data and Voice Jacks:
 - a. Blue
 - b. Gray - All blank inserts shall be Gray.
- B. Faceplates: Faceplates shall be a 4-port, flush mounted, **stainless steel**, CommScope Uniprise solution, for RJ45 outlets at all locations.
 - 1. Approved Products:
 - a. 4-Port Single Gang, CommScope # 760072207 | M14SP-L
 - b. Provide wall mounted handset faceplates where applicable for wall mounted phone. Refer to floor plan for locations. CommScope # 760100891 | M10WL4SP
 - c. Provide Mounting Straps (where applicable)

- C. Workstation Patch Cables: Cabling Contractor shall provide district with (1) – 3 Meter Category 6 patch cable for each data drop on entire project. Each cable will be terminated properly with RJ45 connections on each end with appropriate pin-out assignments per project configuration.
- D. Approved Products: CommScope Uniprise, 3 Meter Cat 6 Patch Cable
 - 1. BLUE

PART 3 - EXECUTION

3.1 GENERAL

- A. Fire Wall Penetrations: The contractor shall avoid penetration of fire-rated walls and floors wherever possible. Where penetrations are necessary, they shall be sleeved with metallic conduit and resealed with an Underwriter Laboratories (UL) approved sealant. Contractor shall also seal all floor, ceiling and wall penetrations in fire or smoke barriers and in the wiring closet.
- B. Allowable Cable Bend Radius and Pull Tension: In general, communications cable cannot tolerate sharp bends or excessive pull tension during installation. Refer to the cable manufacturers allowable bend radius and pull tension data for the maximum allowable limits.
- C. Cable Lubricants: After installation, exposed cable and other surfaces must be cleaned free of lubricant residue.
- D. Pull Strings: Provide pull strings in all new conduits, including all conduits with cable installed as part of this contract. Pull test is not to exceed 200 pounds. Data and video cables can be pulled together with pull strings.
- E. Conduit Fill: Conduit fill shall not exceed 40%.
- F. Damage:
 - 1. The Contractor shall replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, over-tightened bindings, loosely twisted and over-twisted pairs at terminals and cable sheath removed too far (over 1-1/2 inches).
 - 2. The Contractor shall replace any damaged ceiling tiles that are broken during cable installation.
- G. Clean Up:
 - 1. All clean up activity related to work performed will be the responsibility of the Contractor and must be completed daily before leaving the facility.

3.2 DOCUMENTATION

- A. Labels
 - 1. The Contractor will label all outlets using permanent/legible typed or machine engraved labels approved by the Owner (no handwritten labels permitted). Label patch panels in the wiring closet to match those on the corresponding data outlets. The font shall be at least on-eighth inch (1/8") in height, block. All labels shall correspond to as-builts and to final test reports.
 - 2. The following nomenclature should be used when labeling data/voice jacks:
 - 3. All cables being served by MDF closet shall begin with 'M' all IDF served cables shall begin with I# (# designated IDF closet number).
 - 4. Next identification letter shall refer to patch panel that is serving outlet (A, B, C...)
 - 5. Next identification shall note what # data port on patch panel (1 thru 48).
 - 6. Example:
 - a. Outlet from 23rd port of the third patch panel from top of rack located at IDF-2

- 1) I2-C23
- b. Outlet from the 5th port of the second patch panel from the top of rack located at MDF
- 1) M-B5

- B. Floor Plan
 - 1. A floor plan clearly labeled with all outlet jack numbers shall be included in the as-built plans.
- C. Contractor shall label wiring on both ends of cable at workstation and headend locations with machine labels, no exceptions.

3.3 EQUIPMENT RACK CONFIGURATION

- A. Equipment Racks: Equipment racks shall be assembled and mounted in locations shown on the Drawings and as detailed. Each rack shall be securely mounted to the floor and braced to the wall with cable tray in accordance with the manufacturer's instructions and recommendations. Racks shall be mounted such that the side rails are plumb with vertical cable management panels. Racks to be located such that future expansion can occur without relocating existing racks. Racks shall be grounded in accordance with NEC requirements.
- B. Wire Management Components: Horizontal cable management panels shall be installed directly above and below each patch panel, also 1 per patch panel should be left at site to accommodate the switch gear when they are installed. Vertical cable management panels shall be installed on each side of the rack. In instances where more than one rack is installed in a single location, vertical cable management shall be installed between the racks and on either side.
- C. Cable Placement: Cable installation in the Wiring Closet must conform to the Project Drawings. All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance location. Avoid crossing area horizontally just above or below any riser conduit. Lay and dress cables to allow other cables to enter the conduit/riser without difficulty at a later time by maintaining a working distance from these openings.
- D. Cable Routing: Cable shall be routed as close as possible to the ceiling, floor, or corners to ensure that adequate wall or backboard space is available for current and future equipment. All cable runs within the Wiring Closet shall be horizontal or vertical within the constraints of minimum cable bending radii. Minimum bend radius shall be observed. Cables shall not be tie-wrapped to electrical conduit or other equipment.
- E. Installation: All incoming cables shall be routed on the cable tray and neatly dressed down to the patch panels.
- F. Hardware: Provide rack and jack panel hardware as required for all data station wiring.

3.4 STATION WIRING INSTALLATION

- A. General:
 - 1. Cabling between wiring closet and workstation locations shall be made as individual home runs. No intermediate punch down blocks or splices may be installed or utilized between the wiring closet and the communications outlet at the workstation location.
 - 2. All cable must be handled with care during installation so as not to change performance specifications. Factory twists of each individual pair must be maintained up to the connection points at both ends of the cable. There shall never be more than one and one-half inches of unsheathed enhanced Category 6 UTP cable at either the wiring closet or the workstation termination locations.

- B. Exposed Cable:
 - 1. All cabling shall be installed inside walls or ceiling spaces whenever possible. Exposed station cable will only be run where indicated on the Drawings.
 - 2. Additional exposed cable runs will require Owner approval and will only be allowed when no other options exist.

- C. Placement: All cabling and associated hardware shall be placed so as to make efficient use of available space. All cabling and associated hardware shall be placed so as not to impair the Owner's efficient use of their full capacity.

- D. Cable Routes:
 - 1. All cabling placed in ceiling areas must be in conduit, cable tray or J-Hooks. Cable supports shall be permanently anchored to building structure or substrates. Provide attachment hardware and anchors designed for the structure to which attached and that are suitably sized to carry the weight of the cables to be supported. Do not route cable through webbing of structural steel. Cabling must be supported in dedicated supports intended to support cabling as described in this section.
 - 2. Attaching cable to pipes or other mechanical items is not permitted. Use J-Hooks for up to 15 cables (Chatsworth hooks with appropriate brackets). All runs of sixteen (16) or more cables, provide cable rings on 36-inch maximum centers to hang cable. Communications cable shall be rerouted so as to provide a minimum of 18 inches spacing from light fixtures, sources of heat, power feeder conduits and EMI sources. Cabling shall not be attached to ceiling. Grid support wires. Cable runs shall be parallel or perpendicular to building structure. Multiple cables to be bundled together every 6 feet.

3.5 STATION HARDWARE

- A. Flush Mount Jacks: Flush mount jacks shall be mounted in a faceplate with backbox.

- B. Placement: Where possible, the communications outlet shall be located so that its centerline is 18 inches above floor level or 12 inches above permanent bench surfaces. Outlets shall not be mounted on temporary, movable, or removable surfaces, doors, or access hatches.

- C. RJ-45 Jack Pin Assignments:
 - 1. Pin connections for data station cable outlets and patch panels shall match EIA/TIA 568 modular jack wiring recommendation T568B.
 - 2. Pin connections at data jack panels shall match pin connections at outlets (straight through wiring).

3.6 CABLE TESTING REQUIREMENTS

- A. Notification: The Owner and Engineer shall be notified one week prior to any testing so that the testing may be witnessed.

- B. Inspection: Before requesting a final inspection, the Contractor shall perform a series of end-to-end installation performance tests. The Contractor shall submit for approval a proposal describing the test procedures, test result forms and timetable for all copper and fiber optic cabling.

- C. Procedures: Trained personnel shall perform all testing. Acceptance of the test procedures discussed below is predicated on the Contractor's use of the recommended products and adherence to the inspection requirements and practices set forth. Acceptance of the completed installation will be evaluated in the context of each of these factors.

- D. Errors: When errors are found, the source of each shall be determined, corrected and the cable retested. All defective components shall be replaced and retested. Re-test results must be provided on Owner approved forms and witnessed by Owner.
- E. Twisted Pair Cable Testing:
1. At a minimum, the Contractor shall test all station drop cable pairs from Data Closet termination patch panels to outlet device RJ45 jacks. Category 6 products shall be tested for compliance to ANSI/TIA/EIA 568A and ISO/IES 11801 for a Category 6 rated installation. Test equipment used shall meet TIA/EIA TSB-67, Level II accuracy. Further, the contractor shall have a copy of TSB-67 in their possession and be familiar with its contents.
 2. Each wire/pair shall be tested at both ends for the following:
 - a. Wire map (pin to pin connectivity)
 - b. Length (in feet)
 - c. Attenuation
 - d. Near end cross talk (NEXT)
 - e. Power Sum
 3. Test equipment shall provide an electronic and printed record of these tests.
 4. Test results for each Category 6 four-pair UTP cable must be submitted with identification to match labels on all patch panel ports and RJ45 jacks and must match as-builts associated with that cable.
- F. Fiber Optic Cable Testing
1. Testing device for fiber optic cables shall be a high quality OTDR (Optical Time-Domain Reflectometer) equipped with a printer. The printed data shall show, in addition to any summary information, the complete test trace and all relevant scale settings. The OTDR must have the capability to take measurements from bare fiber strands as well as SC connector terminations.
 2. All fiber optic cable shall be tested on the reel before installation to insure that it meets the specifications outlined herein.
 3. After installation the Contractor shall test each fiber strand in accordance the EIA 455-171 Method D procedures (bi-directional testing) at both 850nm and 1300nm for multimode or 1310nm and 1550nm for singlemode. A form shall be completed for each cable showing data recorded for each strand including length, total segment (end-to-end) loss (dB) and connector losses (dB) at each end. In addition, the printed data strip for each strand shall be attached to the form. Patch cables shall also be tested.
 4. Acceptable fiber optic connector loss shall not exceed .75dB per mated pair. The Contractor is responsible for obtaining minimum loss in fiber connections and polishing per manufacturer specifications.
 5. Singlemode:
 - a. Singlemode fibers shall have a maximum attenuation of 1.0 dB/km at 1310 nm and 1.0 dB/km at 1550 nm.
 6. Multimode:
 - a. 50/125um micron multimode fibers shall have a maximum attenuation of 3.5 dB/km at 850 nm and 1.5 dB/km at 1300 nm. Minimum bandwidth shall be 2000 MHz/km at 850 nm and 500 MHz/km at 1300 nm.
 7. OTDR shots shall be provided for each strand of fiber optics completely installed and terminated.

3.7 INSPECTION

- A. Conformance to the installation practices covered above are to be verified when completed. In some cases, the Owner/Designer may inspect before acceptance.
1. Written Test Report:
 - a. Complete test results, including actual values associated with tests.
 - b. Show all certifications for telecommunications wiring systems.

- c. Include cable maps showing each cable route and keyed to cable labels. Provide owner with complete floor plans identifying outlet location and cable routing drawing in AutoCad format. Provide electronic copy of drawings to owner in AutoCad version 14 or greater.
 - d. Documentation of outlet, cable, and rack labeling system.
- B. After performing all tests, tabulate results and bind together in format acceptable to Owner. Installer shall provide written certification in the test report that telecommunications cable is properly installed and test results certify system to all specified standards.

PART 4 - END OF SECTION 27 10 00

SECTION 27 41 16 - INTEGRATED CLASSROOM AV EQUIPMENT

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 RELATED WORK

- A. All Division 01, 26, 27, and 28 at it relates to this scope of work.

1.2 DESCRIPTION

- A. Summary of Work:
1. Remove existing to source, patch panel, or head end and furnish complete and tested video presentation systems in the area of renovation. The video presentation system shall include, but not be limited to the following:
 - a. At owner furnished flat panel display and mount (OFCI) locations, contractor shall provide and install all audiovisual faceplates, transmission media infrastructure, and patch cables required to connect to the associated presentation station device to the associate input device.
 - b. At presentation stations; contractor shall provide and install all audiovisual faceplates, transmission media infrastructure, and patch cables required to connect each presentation display device to the owner provided input device.
 - c. Contractor must coordinate with project construction schedule and existing technology system contractor to provide complete turn-key solution to owner.
 2. The installation shall comply with all applicable codes and standards in effect at the job site and as indicated in the Drawings and Specifications.
 3. Reference project drawings for locations, quantities, and coordination with other trades.
 4. Contractor shall provide a mockup system integrated with two quantity video displays for video switching for demonstration to the owner upon award of this contract. Coordinate with the Architect and owner to schedule date, time, and location for system demonstration.

1.3 QUALITY ASSURANCE

- A. Contractors who do not currently possess the necessary qualifications, trained and experienced personnel, financial capacity, and meet the other requirements herein describe will be disqualified.
- B. The Contractor, as a business entity, shall be an authorized distributor and designated representative of the equipment manufacturer, with full warranty privileges. The proposed contractor shall have been actively engaged in the business of selling, installing, and servicing commercial building commercial communication systems for a period of at least 5 years.
- C. Recently formed companies are acceptable only if specific pre-approval is requested, and granted by the Architect/Engineer, based on experience of key personnel, current and completed projects, and all licensing requirements are met 10 working days prior to the contract proposal date.
- D. The Contractor shall have an office within 150-miles of the job site, staffed with trained technicians who are qualified and licensed to supervise the installation, to be responsible that the system is installed as submitted, to conduct system start up and perform a 100 percent operational audit of all installed devices, to instruct the Owners representatives in the proper operation of the system, and to provide service throughout the warranty period. The contractor shall be capable of dispatching technicians to repair a system within six hours of a service request.

- E. The Contractor shall be fully experienced in the design and installation of the type of system herein specified, and shall furnish with the contract proposal an itemized list of the installations of the type specified herein. The list shall include the name of the project, date of completion, the amount of the contract, the name, and telephone number of a qualified person to contact for reference. This list must contain at least two (2) projects within a 150-mile radius of the school district to allow school administration officials to visit the job site for review of the system installation and service. Each reference project listed must utilize equipment by the same manufacturer as the proposed system.
- F. The Contractor shall employ factory-trained technicians capable of supporting the maintenance of the system. No contract employees are allowed unless they have been to the factory service school within the last 18 months. A certificate of this training shall be provided with the contractors' submittal.
- G. The Contractor shall not have any grievances or complaints of record regarding workmanship, code compliance, or service response. A Proposed Contractor that has any prior finding(s) of a code violation or has any litigation in process concerning the installation of a communication system is unacceptable.
- H. Any discrepancy in quantity or part numbers between the drawings and the bid specifications shall be brought to the attention of the Consultant for clarification during the bidding period. No allowance shall be made to the Contractor by reason of failure to have brought said discrepancies to the attention of the Consultant prior to award of contract.
- I. The Contractor shall provide all necessary patch cables, riser/plenum cabling and connectors interconnecting all equipment and all required A/V and network equipment to provide for fully functional systems. In addition, all cabling raceway, support systems, sleeves and any other materials required to properly install and support cabling systems.
- J. The ability of the Contractor to obtain plans and provide a performance bond shall not be regarded as the sole qualification of the Contractors' competency and responsibility to meet the requirements and obligations of the contract.
- K. The Builder shall be satisfied that a proposed Contractor meets all the requirements expressed herein before including the Contractor's proposal in the project.
- L. The Owner may investigate, as they deem necessary to determine the ability of the proposed Contractor to perform the work. The proposed Contractor shall furnish to the Owner with any information or data requested for this purpose.
- M. The Owner reserves the right to reject any contract proposal if the evidence submitted, or their investigation, fails to indicate that the Contractor is qualified to fulfill of any part of the contract or to complete the work contemplated therein.
- N. The Owner reserves the right to reject the proposal of any Contractor who has previously failed to perform properly, or complete on time, contracts of a similar nature.
- O. Pre-Construction Meeting:
 - 1. The successful Contractor shall attend mandatory pre-construction meetings with individuals deemed necessary by the Owner's representative prior to the start of the work.
 - 2. The contractor shall provide a mock-up of the complete classroom projector system to include all products listed in part 2 of this specification.
 - 3. All proposing contractors must have ability to demonstrate a/v system being

proposed and provide owner with completely installed system to evaluate performance and operation.

P. Acceptance:

1. The Owner's representative reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.

1.4 REGULATORY REQUIREMENTS

A. Standards: All work shall be performed in accordance with the latest revisions of the following standards and codes:

1. Latest Local Codes and Amendments
2. 2015 National Electrical Code

B. Other References:

1. TIA/EIA-568-A Commercial Building Telecommunications Wiring Standard
2. EIA/TIA-569 Commercial Building Standard for Telecommunication Pathways and Spaces.
3. TIA/EIA-606 The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
4. TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
5. EIA/TIA 455-A Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices and Other Fiber Optic Components.
6. TIA/EIA TSB 67 Transmission Performance Specification for Field Testing of Unshielded Twisted-Pair Cabling Systems.
7. TIA/EIA TSB 72 Centralized Optical Fiber Cabling Guidelines
8. ISO/IEC 1180 Generic Cabling Standard
9. EN 50173 Generic Cabling Standards for Customer Premises
10. ANSI/EIA/TIA 526-14 Optical Power Loss Measurements of Installed Multimode Fiber Cable Plan.

C. Governing Codes and Conflicts:

1. If the requirements of these specifications or the Project Drawings exceed those of the governing codes and regulations, then the requirements of these specifications and the Drawings shall govern. However, nothing in the Drawings or Specifications shall be construed to permit work not conforming to all governing codes and regulations.

1.5 ABBREVIATIONS

A. The following abbreviations are used in this document:

- | | |
|-----|----------------------------|
| PS | Presentation station |
| LCD | Flat panel display/monitor |

1.6 SUBMITTALS

A. Project Initiation:

1. Within fourteen (14) days of Notice to Proceed, the data network system installer shall furnish the following in a single consolidated submittal:
 - a. Permits: The Contractor shall obtain all required permits and provide copies to the Owner/Architect/Engineer.
 - b. Product Literature: Complete manufacturer's product literature for all cable, patch panels, cross-connect blocks, cable supports, cable labels,

outlet devices, and other products to be used in the installation. In addition, whenever substitutions for recommended products are made, samples (when requested by the Owner/Designer) and the manufacturer's supporting documentation demonstrating compatibility with other related products shall be included. The submittal shall have some type of distinguishing marker or pointer to indicated what specific product is to be provided

- c. Construction Schedule: A time-scaled Construction Schedule, using PERT/CPM, indicating general project deadlines and specific dates relating to the installation of the cable distribution system.
 - d. Specification Compliance: A letter shall be provided stating, by section and subsection, that the Audio-Video installer complies with the ENTIRE specification section. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. NO DEVIATIONS SHALL BE ACCEPTABLE UNTIL THEY HAVE BEEN ACCEPTED BY THE PROJECT'S TECHNOLOGY CONSULTANT.
 - e. Certifications: The contractor shall submit all of the following certifications and the certifications must contain dates which are valid from the date of proposal and not expirer any sooner than 12 months after substantial completion of the project.
 - 1) Installer Certification: This certification shall show successful completion of system training and must be held by at least 25% of the, on-site, staff and be made available at the site if requested by the owner, architect, and/or project's technology consultant.
- B. Shop Drawings:
1. Submit the following items, for Owner review and approval, within twenty-eight (28) days of notice to proceed:
 - a. Proposed circuit routing and circuit grouping plan prepared by a qualified system designer. The credentials of the designer must be accepted the project's technology consultant prior to submitting a system design.
 - b. In addition to the cable routing, the submitted drawings shall indicate the following, even if the following is expected to be provided by the project's electrical or general contractor:
 - 1) Location of wall penetrations (all penetrations shall be sleeved and contain protective bushings at both ends)
 - 2) Location of sleeved wall pass-thru
 - 3) Size of sleeve at each location installed
 - 4) Quantity of cable passing through each sleeve
 - 5) Location of devices, input plates, and control plates in each room
 - 6) Conduit routing, size, quantity, and stub-up locations for all floor mounted outlets.
 - c. Drawing Compliance: A letter shall be provided stating that the Audio-Video installer complies with the ENTIRE project drawing, including all general, keyed, and notes to contractor. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. NO DEVIATIONS SHALL BE ACCEPTABLE UNTIL THEY HAVE BEEN ACCEPTED BY THE OWNER.
- C. Close-out Procedures:
1. Two (2) copies of the following documents shall be delivered to the building owner's representative at the time of system acceptance. The close out submittals shall include:

- a. Inspection and Test Reports: During the course of the Project, the Contractor shall maintain an adequate inspection system to ensure that the materials supplied and the work performed, conform to contract requirements. The Contractor shall provide written documentation that indicates that materials acceptance testing was conducted as specified. The Contractor shall also provide documentation, which indicates that all cable termination testing was completed and that all irregularities were corrected prior to job completion.
- b. Provide complete test reports for all cabling and devices that comprise system as outlined in this document.
- c. Include the Name, address and telephone of the authorized factory representative with a 24-hour emergency service number.
- d. The manual shall also include Manufacturer's data sheets and installation manuals/instructions for all equipment installed, a list of recommended spare parts.
- e. Generic or typical owner's instruction and operation manual shall not be acceptable to fulfill this requirement.
- f. An up-to-date record ("as-built") set of approved shop drawing prints that have been revised to show each and every change made to the structure cabling system from the original approved shop drawings. Drawings shall consist of a scaled plan of each building showing the placement of each individual item of the Audio-Video system equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.
- g. As-built Drawings shall include cable pathways, and device locations with correct labeling. The as-built drawings shall be prepared using AutoCAD 2013 or later. Provide the Owner with electronic versions of the as-builts on 2 quantity 8GB thumb drive media.
- h. All drawings must reflect point to point wiring, device address and programmed characteristics as verified in the presence of the engineer and/or the end user unless device addressing is electronically generated, and automatically graphically self-documented by the system.
- i. A copy of the manufacturer's warranty on the installed system.
- j. 5 sets of keys to cabinets and/or equipment and special maintenance tools required to repair, maintain, or service the system.
- k. Operating and Maintenance Instructions for all devices within the system. These instructions shall reflect any changes made during the course of construction, and shall be provided to the Owner, for their use, in a three-ring binder labeled with the project name and description. (4 copies)
- l. Quick-start Guide for each system written with the assumption that the intended reader is technically inexperienced and unfamiliar with the facility. Quick-start Guide shall be provided in hard-copy format and in pdf format on an 8GB thumb drive with the close-out documentation.
- m. Upon completion of the work and at a time designated by the Architect or owner, provide formal training sessions for the Owner's operating personnel to include location, operation, and maintenance of all included systems and equipment. Minimum amount of training time shall be at least 8 hours in four 2 hour sessions.
- n. Contractor shall video record training sessions and include videos in close-out documentation in .mov, .wmv, or .avi format.

PART 2 - PRODUCTS

2.1 GENERAL

ALL PRODUCTS LISTED IN THIS SECTION SHALL BE PROVIDED AND INSTALLED BY THE CONTRACTOR.

- A. Installation: The cabling shall be installed per requirements of the manufacturer and the Project Documents utilizing materials meeting all applicable EIA/BICSI standards. The Contractor is responsible for providing all incidental and/or miscellaneous hardware not explicitly specified below as required for a complete and operational system.
- B. Materials: Materials shall be as listed or shall be approved equivalent products of other manufacturers meeting the intent and quality level of the EIA/BICSI specifications. All approved equivalent products will be published by addendum ten days prior to proposal for Architect/Engineer to review.
- C. Testing: All installed cabling shall be tested 100% good after installation by the Contractor.
- D. Ratings: All products shall be new and brought to the job site in the original manufacturer's packaging. Electrical components (including innerduct) shall bear the Underwriter's Laboratories label. All communications cable shall bear flammability testing ratings as follows:
 - CM Communications Cable
 - CMP Plenum Rated Communications Cable
 - CMR Riser-Rated Communications Cable
- E. Initial Cable Inspection: The Contractor shall inspect all cable prior to installation to verify that it is identified properly on the reel identification label, that it is of the proper gauge, containing the correct number of pairs, etc. Note any buckling of the jacket that would indicate possible problems. Damaged cable or any other components failing to meet specifications shall not be used in the installation.
- F. Cable Lubricants: Lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit.
 - 1. Approved Products
 - a. Twisted-pair cable: Dyna-Blue
American Polywater
- G. Fire Wall Sealant: Any penetration through firewalls (including those in sleeves) will be resealed with an Underwriter Laboratories (UL) approved sealant.
 - 1. Approved Products
 - i. Wiremold Flamestopper - #FS4R-RED
 - ii. Precut 4" conduit - #FSPCC4758

2.2 INTEGRATED FLAT PANEL DISPLAY (indicated as 'LCD' on drawings)

- A. Contractor shall mount the owner furnished display and mount at these locations.

2.3 ADDITIONAL PARTS

- A. Provide all materials listed in this specification section to furnish the media infrastructure from input component to output component, to furnish all classroom presentation system locations identified in drawings. Any change orders issued during the course of this project shall pull materials from this additional stock until the stock is depleted. In the event that that such stock is remaining upon the completion of the project, the contractor shall deliver the excess to the owner for attic stock.

2.4 CABLE ROUTING/PATHWAY

- A. Cable Support System: All audio-video cabling shall be installed and supported using a Caddy Cable Cat or Arlington Loop cable support system at 4'-0" intervals unless installed in conduit. Do not exceed manufacture recommendation for the quantity of cables supported in an individual support.
- B. All cable bundles shall be grouped together using plenum rated Velcro for the entire run above and below the ceilings.

2.5 CLASSROOM AUDIO / VIDEO SYSTEM

- A. Provide for each classroom:
 - A. Provide for each classroom:
 - 1. 'PS' Outlet. All cabling shall be routed and connect to the associated 'LCD' device.
 - a. (1) C2G # 41042 wall plate with the following connectors:
 - 1) HDMI
 - 2. 'LCD' Outlet. All cabling shall be routed and connect to the associated 'PS' device.
 - b. (1) C2G # 40489 wall plate with the following connectors:
 - 1) 1.5-in grommet
 - 2) Provide cabling between 'PS' and 'LCD'
 - a. C2G # 41368 75-ft plenum 4K HDMI cable
 - 3) Provide for each classroom for instructor's media source connectivity:
 - a. (1) C2G # 50612, 15' 4K HDMI cable
 - B. Contractor shall follow installation instructions provided by the manufacturer. Installation drawings shall show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
 - C. Contractor shall examine the installation drawings and verify the conditions governing the work on the job site. Contractor shall arrange accordingly, providing such fittings, horizontal cable raceways, conduits, junction boxes and accessories as may be required to meet such conditions.
 - D. Deviations from the installation drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the Systems, shall not be made without the written approval of the Engineer.
 - E. Contractor shall provide all cables, connectors, adapters, etc., required to provide for full integration and proper functionality of all devices.

PART 3 - EXECUTION

3.1 GENERAL

- A. Contractor is required to properly mount projector and connect all ceiling video/audio cables to projector component inputs.
- B. Contractor is required to thoroughly test and verify operation of all projector inputs and video modes prior to project completion.
- C. Contractor is required to focus and adjust projector to properly project image on viewing

surface (screen or multimedia board depending on location).

- D. Contractor shall provide owner with written verification test process and results once all projectors have been installed, tested, and placed in final condition.
- E. Damage:
 - 1. The Contractor shall replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, over-tightened bindings, loosely twisted and over-twisted pairs at terminals and cable sheath removed too far (over 1/4 inches).
- F. The Contractor shall replace any damaged ceiling tiles that are broken during cable installation.
- G. Clean Up:
 - 1. All clean up activity related to work performed will be the responsibility of the Contractor and must be completed daily before leaving the facility.

3.2 DOCUMENTATION

- A. Contractor shall provide owner with detailed serial number listing and associated graphical room number designation equipment was installed. Contractor shall use actual graphical package room numbers not architectural plan numbers from construction set.

3.3 STATION WIRING INSTALLATION

- A. General:
 - 1. All cable must be handled with care during installation so as not to change performance specifications. Factory twists of each individual pair must be maintained up to the connection points at both ends of the cable. There shall never be more than one and one-half inches of unsheathed enhanced Category 6 UTP cable at either the wiring closet or the workstation termination locations.
- B. Exposed Cable:
 - 1. All cabling shall be installed inside walls or ceiling spaces whenever possible. Exposed station cable will only be run where indicated on the Drawings. Additional exposed cable runs will require Owner approval, and will only be allowed when no other options exist.
- C. Placement: All cabling and associated hardware shall be placed so as to make efficient use of available space. All cabling and associated hardware shall be placed so as not to impair the Owner's efficient use of their full capacity.
- D. Cable Routes:
 - 1. All cabling placed in ceiling areas must be in conduit, cable tray or Caddy Cable Cat or Arlington Loop cable support. Cable supports shall be permanently anchored to building structure or substrates. Provide attachment hardware and anchors designed for the structure to which attached and that are suitably sized to carry the weight of the cables to be supported. Do not route cable through webbing of structural steel. Cabling must be supported in dedicated supports intended to support cabling as described in this section. Contractor shall adhere to the manufacturer's suggested fill ratio for each size cable support installed.
 - 2. Attaching cable to pipes or other mechanical items is not permitted. Communications cable shall be rerouted so as to provide a minimum of 18 inches spacing from light fixtures, sources of heat, power feeder conduits and EMI

sources. Cabling shall not be attached to ceiling. Grid support wires. Cable runs shall be routed down the corridors; parallel or perpendicular to building structure. Multiple cables to be bundled together at and between each cable support installed.

3. Contractor shall be responsible for coordinating with other trades on the project so that the installed cable pathway does not interfere with the installation of other systems to insure that mechanical ducts, pipes, conduits, or any other above ceiling systems are not putting unnecessary stress on any portion of the install audio-video cabling.

3.4 STATION HARDWARE

- A. Flush Mount Jacks: Flush mount jacks shall be mounted in a faceplate with back box.
- B. Placement: As shown on drawings.

3.5 TESTING, CERTIFICATION, WARRANTY, SERVICE

- A. A factory trained service technician shall supervise the final connections and testing of the system and it shall be subject to the final acceptance of the Architect, Engineer, and local authorities. Testing shall ensure the following:
 1. Before energizing the cables and wires, check for correct connections and test for short-circuits, ground faults, continuity, and insulation.
 2. Complete and functional system.
 3. Installed in accordance with manufacturer's instructions.
 4. Upon completion of the testing, the manufacturer or his representative shall issue to the Owner a letter of certification attesting to the fact that he has tested and adjusted the system, that all components are properly installed and free of defects, and that the system is in compliance with this specification.
- B. The contractor shall provide a warranty for the installed system. The warranty shall be against defects in material or workmanship for a period of one (1) year from the date of substantial completion. Any equipment or wiring shown to be defective shall be replaced, repaired, or adjusted free of charge. All labor and materials shall be provided at no expense to the Owner. All equipment will carry a one year warranty or manufacturer's warranty whichever is greater.
- C. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

3.6 DRAWINGS, MANUALS AND TRAINING

- A. In addition, the contractor shall furnish complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets. Manuals shall include wiring diagrams to indicate internal wiring for each device and the interconnections between the items of equipment. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system. Provide a parts list with manufacturer and model number for commonly replaced parts. Include complete instructions for the inspection, testing, and maintenance of the system. Include copies of all programming sheets used to configure the system.
- B. The Contractor shall conduct formal on-site training sessions. Provide documented general instruction as follows:
 1. Provide instruction to District personnel to include the location, inspection, maintenance, testing, and operation of all system components. Provide a minimum of four (8) hours -- four 2-hour sessions separated by a minimum of two weeks.
 2. Provide instruction to designated personnel on the functions and operation of the intercom

and master clock system including emergency and service request procedures. Provide a minimum of four (4) hours--two 2-hour sessions separated by a minimum of two weeks.

END OF SECTION

SECTION 28 05 00 - GENERAL ELECTRONIC SAFETY SYSTEMS REQUIREMENTS

PART 1 – GENERAL

1.1 WORK INCLUDES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1, apply to this Section.
- B. Furnishing of all required materials, equipment, tools, scaffolding, labor, and transportation necessary for the complete installation of the Electronic Safety Systems as shown on the drawings and as specified herein.
- C. Coordinate wireway, raceway, power, and outlet requirements with the builder and the electrical contractor.
- D. Cable pathways, conduit, boxes, and cable support systems shall be complete with bushings, de-burred, cleaned, and secure prior to installation of cable.
- E. The Electronic Safety Systems Contractor shall provide and install prior to cable installation plastic snap in bushings at each box opening, passage through a metal stud, and at the end of all open conduit stubs or sleeves to protect the cabling from damage.
- F. Supply in a timely manner to the electrical contractor special backboxes for installation as required.
- G. It is the intent of the Contract Documents to provide complete installations although every item necessary may not be specifically mentioned or shown.
- H. It is the intent of the Contract Documents to provide an extension of the existing installed systems interfaced with new systems, complete in every respect.
- I. Provide line-by-line specification review for each Division 28 section annotated to certify compliance or deviation.

1.2 WORK TO BE INCLUDED BY THE ELECTRICAL CONTRACTOR IN BASE CONTRACT PROPOSAL

- A. Provide utility services conduit as outlined on drawings as required.
- B. All required conduit for accessibility to attic space.
- C. Furnishing and installation of all required standard back boxes and conduit.
- D. Installation of special back boxes supplied by Division 28 contractor(s).
- E. Furnishing and installation of all floor boxes, surface raceways, and other wireways which are detailed or specified under Division 26.
- F. Provide equipment-mounting boards as outlined on drawings.
- G. Provide equipment grounding system, conductors, and bus bars and as outlined in Division 26.
- H. Provide 120-volt power and hook-up to equipment provided in Division 28.

- I. Coordination of requirements of Division 28 with the Builder.

1.3 WORK NOT INCLUDED

- A. Contractors shall make no agreement that obligates the Owner to pay any company providing communications, monitoring, or other services. Contractors shall not make selection, purchase, or installation of interconnect instruments/equipment to be used on this project.

1.4 RELATED SECTIONS

- A. The conditions of the Division 0, Division 1, Division 26 requirements, and the contract requirements that include the General Conditions and the Supplementary Conditions apply to work of this division.
- B. Section 26 05 34 - Provisions For Communication, Security & Safety Systems.

1.5 CODES, STANDARDS, AND THEIR ABBREVIATIONS

- A. General:
 - 1. Perform all work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are exceeded by the contract documents.
 - 2. In addition to the requirements outlined in other sections of the specifications the following standards are imposed as applicable to the work in each instance:
 - a. OSHA Safety and Health Regulations for Construction.
 - b. NFPA No. 70 National Electrical Code.
 - c. NESC National Electrical Safety Code, ANSI Standard C2.
 - d. NEiS National Electrical Installation Standards.
 - e. Local Codes and Ordinances.
- B. Where local codes or practices exceed or conflict with the NEC, it shall be the Contractor's responsibility to perform the work in accordance with the local code prevailing and local interpretations thereof. Any such additional work shall be performed at no additional cost to the Owner.
- C. Materials and components shall be UL listed and labeled by Underwriters Laboratories, Inc. for the intended use under the latest appropriate testing standard.
- D. The Contractor shall obtain all permits required to commence work. Upon completion of the Work, the Contractor shall obtain and deliver to the Owner's Representative a Certificate of Inspection and Approval from the State Board of Fire Underwriters and other authorities having jurisdiction. The Contractor shall pay required permit fees.

1.6 LIST OF ASSOCIATIONS AND STANDARDS:

- ADA: Americans with Disabilities Act.
- ANSI: American National Standards Institute, 1430 Broadway; New York, NY 10018.
- ASTM: American Society for Testing and Materials, 1916 Race Street; Philadelphia, PA 19103.
- BICSI: (RCDD5 Standards), 8610 Hidden River Parkway, Tampa, FL 33637
- CBM: Certified Ballast Manufacturers Association, 2116 Keith Building; Cleveland, Ohio 44115.
- IEEE: Institute of Electrical and Electronics Engineers, 345 East 47th Street; New York, NY 10017.
- ICEA: Insulated Cable Engineers Association, P.O. Box P, South Yarmouth, MA 02664.
- NEC: National Electrical Code; NFPA No. 70.

- NECA: National Electrical Contractors Association, Inc., 7315 Wisconsin Ave.;
Washington, DC 20014.
- NEMA: National Electrical Manufacturers Association, 155 East 44th Street; New York,
NY 10017.
- NESC: National Electrical Safety Code, ANSI Standard C2.
- NFPA: National Fire Protection Association, 60 Batterymarch Street; Boston, MA
02110.
- OSHA: Occupational Safety and Health Administration, US Department of Labor;
Washington, DC 20402.
- UL: Underwriters Laboratories, Inc., 333 Pfigsten Road; Northbrook, IL 60062.

- A. Nothing in the Contract Documents shall be construed to permit work not conforming to these codes.
- B. When two or more codes or standards are applicable to the same work, then the stricter code or standard shall govern.
- C. The date of the code or standard is that in effect on the date of issue stated on the contract documents, except when a particular publication date is specified.
- D. The Contractor shall comply with all State, Federal, NFPA, local codes and ordinances that may alter any part of the plans or specifications. The Contractor shall bear all costs for correcting any deficiencies due to non-compliance.
- E. Where local codes and ordinances are not in writing or on record but local precedence have been set, the Owner shall pay for any additional resulting cost.

1.7 DEFINITIONS

- A. Approval: It is understood that approval must be obtained from the Architect in writing before proceeding with the proposed work. Approval by the Architect of any changes, submitted by the Contractor, will be considered as general only to aid the Contractor in expediting his work.
- B. The Builder: The primary contractor engaged to oversee the construction project. They may be technically described as a Construction Manager, General Contractor, Managing Construction Contractor, et cetera.
- C. The Contractor: The Contractor engaged to execute the work included a particular section only, although he may be technically described as a Subcontractor to the Builder. If the Contractor, engaged to execute said work, employs Sub-Contractors to perform various portions of the work included under a particular Section, they shall be held responsible for the execution of this work, in full conformity with Contract Document requirements. The Contractor shall cooperate at all times and shall be responsible for the satisfactory cooperation of his Subcontractors with the other Contractors on the job so that all of the various sections and phases of work may be properly coordinated without unnecessary delays or damage.
- D. The Electrical Contractor: The Electrical Contractor shall be engaged to execute the work included Division 26 only.
- E. PDF file or .pdf: The filename extension associated with "Portable Document Format" files, which are multi-platform computer files in the ISO 32000-1:2008 open standard format developed and licensed by Adobe Systems. These files are a digital electronic representation of text, documents, images, and technical drawings in a font and color-accurate fixed-layout format that is platform and display resolution independent. PDF files can be electronically transmitted, viewed, or printed with various free PDF reader application programs, and may allow markups/comments with various PDF editing application programs.

- F. Provide: Defined as requiring both the furnishing and installation of the item or facility indicated, complete in all respects and ready for operation unless otherwise specifically noted.

1.8 SCHEDULE OF VALUES, APPLICATION FOR PAYMENT

- A. The Contractor shall in accordance with the General Provisions of the Contract, including General and Supplementary Conditions, and Division 1, complete a Schedule of Values and Applications for Payment. When a portion of this work separately funded, including donations or E-Rate, the contractor shall accommodate this in the Schedule of Values and Applications for Payment. For E-Rate eligible portions of this work, the contractor will be required to participate in the E-Rate program, comply with all E-Rate regulations, and provide billing as needed. The contractor shall coordinate with the Owner to file Form 471 or latter edition and/or other forms as may be required.

1.9 WARRANTY

- A. The Contractor shall warranty his work against defective materials and workmanship for a period of one year from date of acceptance of the job.
- B. Neither the final payment nor any provisions in Contract Documents shall relieve the Contractor of the responsibility for faulty materials or workmanship.
- C. He shall remedy any defects due thereto and pay for any damage to other work resulting there from, which shall appear within a period of one year from date of substantial completion.
- D. The Owner shall give notice of observed defects with reasonable promptness.
- E. This Warranty shall not be construed to include the normal maintenance of the various components of the system covered by these specifications.

1.10 SITE VISIT

- A. Before submitting a proposal, each proposed contractor shall examine all plans and specifications relating to the work, shall visit the site of the project, and become fully informed of the extent and character of the work required, including all required utilities.
- B. No consideration will be granted for any alleged misunderstanding of the materials to be furnished or the amount of work to be done, it being fully understood that the tender of a proposal carries with it the agreement to all items and conditions referred to herein, or indicated on the accompanying plans or required by nature of the site of which may be fairly implied as essential to the execution and completion of any and all parts of the work.

1.11 SUBMITTALS

- A. Submittal procedures shall be per Division 1 - General Requirements.
- B. Provide a complete submittal for each section as specified.
- C. Submit complete submittal package within 30 calendar days after award of this work for approval. Equipment is not to be ordered without approval. Partial submittals are not acceptable for review. Each submittal shall include a dated transmittal.
- D. A submittal may be electronically transmitted in PDF file format (preferred) or paper copies may be provided in quantities indicated in Division 1. Paper copies shall be organized including index tabs in a 3-ring black binder of sufficient size.
- E. Each Product data submittal shall include:
 - 1. A cover sheet with the name and location of the project, the name, address, and

- telephone number of the Contractor, and the name, address, and telephone number of the submitting sub-contractor. Include on or after the cover sheet sufficient space for review stamps.
2. An indication of any deviations from Contract Document requirements, including variations and limitations. Show any revisions to equipment layout required by use of selected equipment.
 3. A product data index and complete equipment list including for each product submitted for approval the manufactures name and part number, including options and selections.
 4. Cut-sheets or catalog data illustrating the physical appearance, size, function, compatibility, standards compliance, and other relevant characteristics of each product on the equipment list. Indicate by prominent notation (an arrow, circle, or other means) on each sheet the exact product and options being submitted.
 5. Submit design data, when the scope of work requires, including calculations, schematics, risers, sequences, or other data.
 6. When the contract requires extended product warranties, submit a sample of warranty language.
 7. Any resubmittal shall include a complete revised equipment list and any product data that is revised.
- F. Submit shop or coordination drawings, when specified or the required for the scope of work, which include information that will allow to the Contractor to coordinate interdisciplinary work and when necessary guide the manufacturer or fabricator in producing the product. Shop or coordination drawings shall be specifically prepared to illustrate the submitted portion of work, this may require diagrams, schedules, details, and accurate to scale equipment and device layouts prepared using a CAD or BIM engineering drawing program.
- G. The Engineer's review of submittals is only for confirmation of adherence to design of project and does not relieve the Contractor of final responsibility for furnishing all materials required for a complete working system and in complying with the Contract Documents in all respects.

1.12 PROJECT RECORD DOCUMENTS

- A. The Contractor shall keep a set of plans on the job, noting daily all changes made in connection with the final installation including exact dimensioned locations of all new and uncovered existing utility piping outside the building.
- B. Upon submitting his request for final payment, he shall turn over to the Architect/Engineer, for subsequent transmittal to the Owner revised plans showing "as installed" work.
- C. In addition to the above, the Contractor shall accumulate during the jobs progress the following data in PDF file format (preferred) or paper copies to be turned over to the Architect/Engineer for checking and subsequent delivery to the Owner:
 1. All warranties, guarantees, and manufacturer's directions on equipment and material covered by the Contract.
 2. PDF file or paper copies of all Shop Drawing prints and CAD or BIM engineering drawing program files.
 3. Any software programs, data/programming files, passwords, special interface cables, or keys that may be needed to maintain or access equipment.
 4. Set of operating instructions. Operating instructions shall also include recommended maintenance and seasonal changeover procedures.
 5. Any and all other data and/or plans required during construction.
 6. Repair parts lists of all major items and equipment including name, address, and telephone number of local supplier or agent.
 7. The first page, or pages, shall have the names, addresses, and telephone numbers of the following:
 - a. Builder and all Contractors.
 - b. Major Equipment Suppliers

- c. Submit communication systems warranties.

1.13 TRAINING

- A. Upon completion of the work and at a time designated by the Architect, provide formal training sessions for the Owner's operating personnel to include location, operation, and maintenance of all Electronic Safety Systems equipment and systems.
- B. See other sections for time requirements.

1.14 PLANS AND SPECIFICATIONS

- A. The intent of the project drawings is to establish the types of systems and functions, but not to set forth each item essential to the functioning of the system.
- B. Electrical drawings are generally diagrammatic and show approximate location and extent of work.
- C. Install the work complete including minor details necessary to perform the function indicated. Provide Electronic Safety Systems (including all hook-ups) complete in every respect and ready to operate.
- D. If clarification is needed, consult the Architect/Engineer.
- E. Review pertinent drawings and adjust the work to conditions shown. Where discrepancies occur between drawings, specifications, and actual field conditions, immediately notify the Architect/Engineer for his interpretation.
- F. The Architect/Engineer reserves the right to make any reasonable change in the location of any part of this work without additional cost to the Owner.

1.15 PRODUCT SUBSTITUTIONS:

- A. Descriptions and details, acceptable manufacturers' names listed, and specific manufacturer and model number items indicated in the plans and specifications shall establish a standard of quality, function, and design. Manufacturers and model numbers listed "no exceptions" shall not be substituted without specific notice in an addendum. Otherwise, where a specific manufacturer's product is indicated, products of other manufacturers listed as acceptable may be submitted for approval based on the substitute product being, in the opinion of the Engineer, of equivalent or better quality than that of the product specified.
- B. Proposed contractors wishing to propose systems which differ in manufacturer, features, functions, or operating characteristics from those outlined in these specifications must do so in writing to the specifying authority at least ten (10) days prior to the proposal opening.
- C. For manufacturers equipment or models other than that specified, the proposed contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment. Proposals must include detailed information showing all deviations from the system as specified and include relevant technical and cost data. This shall include a complete description of the proposed substitution, drawings, catalog cuts, performance data, test data, or any other data or information necessary for evaluation.
- D. The Engineer will consider all such submittals and the Architect will issue an addendum listing items that the Engineer considers acceptable. Only such items as specified or approved as acceptable will be installed on this project.

- E. Substitute products for which the proposed contractor does not obtain prior approval will not be considered acceptable for this project. Final approval of the alternate system shall be based on the decision of the Owner and Architect. Prior approval to make a proposal for this project does not automatically ensure the system will be an acceptable equivalent.
- F. The Contractors' proposal represents that the contract proposal price is based solely upon the materials, equipment, and labor described in the Contract Proposal Documents (including addenda, if any) and that he contemplates no substitutions or extras.
- G. The manufacturer of the proposed substitute unit shall provide samples for evaluation, when required, at no charge and non-returnable.
- H. Requests for substitution are understood to mean that the Contractor:
 - 1. Has personally investigated the proposed substitution and determined that it is equivalent or superior in all respects to that specified.
 - 2. Will provide the same guarantee for the substitution that he would for that specified.
 - 3. Will, at no cost to the Owner, replace the substitute item with the specified product if the substitute item fails to perform satisfactorily.
 - 4. After Award of the Contract, substitutions will be considered only under one or more of the following circumstances:
 - a. The substitution is required for compliance with subsequent interpretations of code or insurance requirements.
 - b. The specified product is unavailable through no fault of the Contractor.
 - c. The manufacturer refuses to warranty the specified products as required.
 - d. Subsequent information indicates that the specified product is unable to perform properly or to fit in the designated space.
 - e. In the Engineer's sole judgment, the substitution would be in the Owner's best interest.
 - f. Revisions to the electrical system caused by substitutions shall be under the supervision of the Engineer, at a standard hourly rate charged by the Engineer. Charges from the Engineer, Architect, and Electrical Contractor shall be paid by the Contractor originating the changes.

1.16 FUTURE USE CABLING

- A. When cabling is installed for future use, it shall be identified with a tag of sufficient durability to withstand the environment involved.
- B. Locations and Existing Conditions:
 - 1. Location and condition of any existing equipment or services, when shown, have been obtained from substantially reliable sources, are shown as a general guide only, without guarantees as to accuracy.
 - 2. The Contractor will examine the site, verify all requirements, service points, and availability of all services required to complete this project. No consideration will be granted for any alleged misunderstanding of the materials and labor to be provided as necessitated by nature of the site including those items that may be fairly implied as essential to the execution and completion of any and all parts of this project.

1.17 PROTECTION OF EQUIPMENT AND MATERIALS

- A. The Contractor shall take such precautions as may be necessary to protect his apparatus from damage.
- B. This shall include the creation of all required temporary shelters to protect any apparatus above the floor of the construction and the covering of apparatus in the completed building with tarpaulins or other protective covering.

- C. Failure to comply with the above to the satisfaction of the Owner's inspector will be sufficient cause for the rejection of the equipment in question and its complete replacement by the Contractor.

1.18 FINAL OBSERVATION

- A. It shall be the duty of the Contractor to make a careful observation trip of the entire project, assuring themselves that the work on the project is ready for final acceptance before calling upon the Architect/Engineer to make a final observation.
- B. To avoid delay of final acceptance of the work, the Contractor shall have all necessary bonds, warranties, receipts, affidavits, et cetera, called for in the various articles of these specifications, prepared and signed in advance, together with a letter of transmittal, listing each paper included, and shall deliver the same to the Architect/Engineer at or before the time of said final observation. The Contractor is cautioned to check over each bond, receipt, et cetera, before preparing for submission to verify that the terms check with the requirements of the specifications.
- C. The following and other provision of Division 1 General Conditions will be required at time of final completion:
 - 1. Final clean up completed.
 - 2. All systems are fully operational, all material and devices installed.
 - 3. As built (as installed) drawings and operations manuals.

1.19 PROHIBITED MATERIALS

- A. No new asbestos, lead, or materials containing these substances shall be permitted in this project. The Contractor shall consult the Architect concerning these materials if their presence is suspected. All work in or around existing asbestos or lead materials is at the sole risk of the Contractor and his personnel.

1.20 CUTTING AND PATCHING

- A. Notify the Builder sufficiently ahead of construction of any floors, walls, ceiling, roof, et cetera, of any openings that will be required for his work.
- B. The Contractor shall see that all sleeves required for his work are set at proper times to avoid delay of the job.
- C. All necessary cutting of walls, floors, partitions, ceilings, et cetera, as required for the proper installation of the work under this Contract shall be done at the Subcontractor or at the Subcontractor's expense in a neat and workmanlike manner, and as approved by the Architect/Engineer.
- D. Patching of openings and/or alterations shall be provided by the Electronic Safety Systems Subcontractor or at the Subcontractor's expense in an approved manner.
- E. No joists, beams, girders, or columns shall be cut by any Contractor without first obtaining written permission of the Architect/Engineer.
- F. All openings in firewalls and floors shall be completely sealed after installation for a completely airtight installation. Sealing material shall be non-combustible and UL approved. The installed sealing assembly shall not cause the fire rating of the penetrated structure to be decreased.
- G. All openings in exterior walls shall be sealed watertight.
- H. Seal voids around conduits penetrating fire-rated assemblies and partitions using fire stopping

materials and methods in accordance with NFPA and local codes.

1.21 MANUFACTURERS' INSTRUCTIONS

- A. All equipment and devices shall be installed in accordance with the drawings and specifications, manufacturer's instructions, and applicable codes.
- B. Where specifications call for installation of a product to be in accordance with manufacturer's instructions and/or where manufacturer's instructions are required for installation of a product, it shall be the contractor's responsibility to obtain the necessary applicable manufacturer's instructions and install the product in accordance with the manufacturer's instructions.
- C. It shall be the Contractor's responsibility to install all equipment, materials, and devices shown on the plans and as called out in these specifications even if manufacturer's instructions are absolutely unattainable.

1.22 INSTALLATION

- A. Cooperation with trades of adjacent, related or affected materials or operations, and or trades performing continuations of this work under subsequent contracts are considered a part of this work. In order to effect timely and accurate placing of work and to bring together, in the proper and correct sequence, the work of such trades, including work provided under a Division 1 allowance.
- B. The Electronic Safety Contractor shall coordinate installation of the systems with the Builder, Electrical, Mechanical, and Plumbing Contractors to ensure a complete working system for the Owner.
- C. Where required for accessibility all conduit and boxes for all Electronic Safety Systems shall be provided by the Electrical contractor as specified, including systems in Division 28, any and all allowances shall be included. Normally low voltage wiring shall run open and supported in accessible attic space. All low voltage wiring in exposed areas such as gyms, stages, shops, and field houses shall be enclosed in conduit. Coordinate with and verify with Division 26 to provide required conduit and boxes at locations and heights as required.
- D. Conduit, innerduct, track, or raceway shall conceal and protect wiring in exposed areas, within walls, through in- accessible areas, floors, chases, under slab, crawlspaces, or underground.
- E. All conduit, duct, track, and raceway runs shall be spaced apart to allow for maintenance, such as the installation of couplings, without disturbing adjacent pathways.
- F. All work must be performed by workers skilled in their trade. The installation must be complete whether the work is concealed or exposed.
- G. Provide stainless screw/bolt hardware wherever stainless devices are used and in potentially wet areas.
- H. Coordinate the actual locations of devices and outlets and equipment with building features and mechanical equipment as indicated on architectural, structural, and mechanical drawings. Review with the Architect any proposed changes in outlet or equipment location. Relocation of devices, before installation, of up to 3 feet from the position indicated, may be directed without additional cost. Remove and relocate outlets placed in an unsuitable location when so requested by the Architect.

1.23 ADDITIONAL MATERIALS: INCLUDE IN THE BASE CONTRACT PROPOSAL

- A. All costs to provide 10 additional fire alarm signals including all cable and devices as directed

by the Architect. Conduit and standard back boxes by Division 26 Electrical Contractor.

PART 2 – PRODUCTS

- A. Not Applicable

PART 3 – EXECUTION

- A. Not Applicable

END OF SECTION

SECTION 28 31 00 FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Provide a complete, fully addressable, power limited, fire detection system for this project. The system shall be connected, tested, verified by AHJ to be acceptable and left in first class operating condition. All equipment herein specified shall be engineer-approved and California State Fire Marshal (CSFM) listed. The entire installation shall conform to the National Fire Protection Association (NFPA) Standard 72, 2016 90A & CEC Article 760 and authorities having jurisdiction as applicable. The system specified and depicted on the plan is a complete and approved system. The entire fire alarm system has been submitted and approved by the Division of the State Architect as a complete submittal. Any routing of the system wiring that is significantly different than shown on the approved drawings shall have the approval of the engineer and must be obtained prior to construction.
 - 2. Provide all work and material as shown and / or required to provide a fully functional and adequate system as described hereon and as required by the California State Fire Marshal.
 - 3. Supervision: The fire alarm system shall monitor the integrity of all alarm initiating and indicating appliance circuits and provide local and remote status of all connected systems. The system shall be provided with automatically charged standby batteries to maintain system operation for 24 HRS in the normal supervisory mode and 15 minutes of alarm. Batteries shall be supervised for connection to the system and low voltage threshold. The automatic battery charger shall be capable of charging fully discharged system batteries to 100% in 8 hours.
 - 4. The system wiring and installation shall be as stated in drawings and as required by the manufacturer. All wiring shall be color coded, tagged and verified to assure that it is free from shorts and grounds and shall be rated for the appropriate environmental conditions such as well locations.
 - 5. Testing: The completed system shall be tested in accordance with NFPA Standard 72 7.6.6 and 7.8.2.
 - 6. All Fire Alarm wiring shown in drawings shall be installed in conduit.
 - 7. System Operation shall include:
 - a. Separate zone signaling and device status indication for all initiating devices.
 - b. Audible to sound the California uniform fire alarm signal in temporal mode. Devices shall be at least 15dBA above average ambient sound level, but not less than 75dBA at 10' or more than 120dBA.
 - c. Visual devices shall not exceed 2 flashes per second and shall not be slower than 1 flash per second. Visual devices shall be synchronized when 3 or more devices are within the same field of view.
 - d. Supervision of all circuits to indicate any abnormal wiring condition.
 - e. N.O./N.C. integral relays for external device interface or as indicated on drawings.
 - f. Central station connection capable of indicating (3) distinct separate signals as being tamper, trouble and alarm with point reporting capabilities.

8. All work shall be completed as shown on the plans and or as specified within this specification and shall include the following (but is not limited to):
 - a. Life safety fire alarm detection and signaling system.
 - b. Furnishing and installation of equipment and devices.
 - c. Conductors, connections and interconnections where specified and all in conduit system.
 - d. Conduit, wire and connections for control of heating and ventilation motors, smoke dampers and smoke exhaust.
 - e. Testing, cleaning and adjusting of completed work.
 - f. Wiring diagrams, as-built drawings and three (3) sets of equipment operations and maintenance instructions for Owner.
 - g. Complete maintenance for two years.
 - h. Proposal for subsequent maintenance contract.
 - i. All work and material for complete and operable systems as indicated or specified.
 - j. Permits, inspections and fees.
 - k. Identification and instruction to Owner Representative. Training shall consist of a minimum or two (2) 6-hour sessions.
9. Coordination with Section 26 05 33: Raceway and Boxes for Electrical Systems.
10. Furnishing of special back boxes where required for installation of fire alarm devices.
11. All conductors to be installed in conduit pursuant to Specification Section 26 05 33: Raceway and Boxes for Electrical Systems.
12. Qualifications: Contractor shall receive written approval and verified test results which shall be submitted to the owner for system from manufacturers recognized representative prior to completion and acceptance.
13. All initiating devices shall be separately addressed for individual identification at control panel.
14. As-Built Drawings: A complete set of reproducible “as-built” drawings showing installed wiring, color coding, wire tag notations exact locations of all installed equipment, specific interconnections between all equipment and internal wiring of the equipment shall be delivered to the owner upon completion of the system.
15. Maintenance Instructions: Three (3) submittals of maintenance instructions shall be provided and shall be complete, easy to read, understandable and shall provide the following information:
 - a. Instructions for replacing any components of the system, including internal parts.
 - b. Instructions for periodic cleaning and adjustments of equipment with a schedule of these functions.
 - c. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.
 - d. User operating instructions shall be prominently displayed on a separate sheet located next to the control unit in accordance with UL Standard 864. The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defects for two years from the date of final acceptance.
16. The FACP shall integrate with the to prevent bells from activating during a fire alarm.
17. The FACP shall meet the requirements of UL ANSI 864 Ninth Edition. Systems listed to UL ANSI 864 Eighth Edition or earlier revisions are not acceptable.

18. Per DSA IRA-1 chapter of approval for temporary school use of DSA approved relocatable buildings, Approval of fire alarm and/or fire sprinkler systems for temporary use buildings shall be in accordance with the Chapter 9, CCR, Title 24, Part 2.
 - a. Fire Alarm: Section 3.4.4.4 For buildings sited less than three years and used for educational purposes (instruction), provide an approved manual fire alarm system consisting of manual pull-stations, visual notification appliances and audible device(s) (with a minimum rating of 95 dBA at 10 feet). Buildings more than 25 feet apart are to be provided with additional audible devices to ensure the fire alarm signal can be heard within adjacent buildings.
 - b. Communications: Section 3.4.4.5 Buildings more than 25 feet from other buildings, including other temporary buildings, with a stand-alone fire alarm system must be provided with approved “two-way communication” with the main administration offices consisting of an intercom system, permanently mounted telephone or “walkie-talkie” devices or other similar systems. Buildings that are less than 25 feet from existing permanent buildings on the site shall be interconnected with the campus fire alarm system.
- B. Substitutions
 1. Substitution of system components or manufacturer will require the contractor to separately obtain approval with DSA at Contractor’s expense and shall meet all requirements of the system as designed and pre-approved.
 2. All proposed substitutions shall be listed with the California State Fire Marshal.

1.3 SUBMITTALS

- A. Comply with applicable provisions of Section 26 05 00: Common Work Results for Electrical.
- B. General:
 1. Two (2) copies of all submittals shall be submitted to the Architect/Engineer for review and approval.
 2. All references to manufacturers model numbers and other pertinent information herein is intended to establish minimum standards of performance, function, and quality.
 3. For equipment other than that specified, the contractor shall provide proof that the proposed substitute equipment equals or exceeds the form, feature, function, performance, and quality of the specified equipment.
- C. Product Data:
 1. A complete list of all supplied equipment including model numbers with catalog data sheets on each component.
 2. Data sheets show California State Fire Marshal Listing, U.L. listing, equipment ratings, dimensions and finishes.
 3. Highlight actual devices to be used and their amp draw in stand-by and alarm modes.
- D. Shop Drawings:
 1. Provide schematic layout, floor plan, drawings indicating location of all components and equipment, required size and location of conduit and outlets and type and quantity of system conductors. Include voltage drop calculations and battery calculations based on actual number of devices to be installed.
 2. Include riser and wiring diagrams for overall system and components including control panels, annunciators, power supplies, initiating circuits, notification appliances, control devices and FATC. Address numbers shall be noted on all appliances.

3. Include physical and electrical characteristics of equipment to indicate conformance with the Specifications.
 4. Describe system characteristics and function as well as device wiring diagrams.
 5. Voltage drop and battery calculations for each control panel and power supply and initiating circuits at 24 hour stand-by and 15 mins alarm.
 6. System operational matrix.
- E. Operating and Maintenance Instruction Manual:
1. Manual shall include the following tailored to this specific project:
 - a. Operational description.
 - b. Coded cabling plan.
 - c. Two wire circuit diagrams.
 - d. Wiring destination schedule.
 - e. Schematic component diagrams and PC board layouts.
 - f. Maintenance and alignment procedures.
 - g. Voltage drop and battery calculations.
- F. Other documentation
1. In addition to the shop drawings, the following information shall also be included with the submittal.
 - a. Manufacturer's technical data sheets for each piece of equipment that will be installed.
 - b. Standby battery calculations for the FACP and any remote power supply or other panels that include their own standby batteries.
 - c. Voltage drop calculations showing the worst-case end of line voltage for all notification appliance circuits
 - d. Detailed description of the overall operation of the system or a sequence of operation matrix.
 - e. Proof of factory training and certification of the supervising technician assigned to the project.
 - f. Proof of factory training and certification of a service technician employed by the installation company that can be onsite to troubleshoot and repair any service-related problems with the system, within 4 hours of being notified of the problem.

1.4 PERFORMANCE REQUIREMENTS

- A. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
- B. Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.
- C. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.
- D. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

- E. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.
 - F. NAC circuits and control equipment shall be arranged such that loss of any one (1) NAC circuit will not cause the loss of any other NAC circuit in the system.
 - G. Two-way emergency telephone communication circuits shall be supervised for open and short circuit conditions.
 - H. The secondary power source of the fire alarm control panel shall be capable of providing at least 24 hours of backup power with the ability to power the system for an additional 15 minutes in an alarm condition, at the end of the 24-hour backup period.
- I. Basic System Operation
- 1. When an off normal condition occurs (Alarm, Supervisory, or Trouble) the respective LED on the FACP shall illuminate.
 - 2. A piezo sounder shall activate at the FACP during any off normal condition until the SILENCE button is pressed by an authorized user.
 - 3. A Red LED shall illuminate when an alarm or pre-alarm condition exists.
 - 4. An Amber (yellow) LED shall illuminate when a Supervisory or Trouble condition exists.
 - 5. A backlit 4-line 40-character LCD screen shall display all messages that refer to an off-normal condition.
 - 6. An Alarm condition shall have priority over all other signals.
 - 7. The FACP shall include an event buffer that maintains the last 4,000 system events including a date and time stamp for each.
 - 8. In response to a fire alarm condition, the systems notification appliances and relay-controlled output circuits that are associated through programming with the device initiating the alarm, shall automatically activate. Additionally, the system shall notify an approved central station via dial-up, IP, or cellular means as deemed acceptable by the local Authority Having Jurisdiction (AHJ).

1.5 QUALITY ASSURANCE

- A. Loads of Equipment and Components
 - a. Follow IEEE Standard where applicable.
 - b. Provide fuse protection for equipment and spare fuses.
 - c. Design systems for operation at 120 volts, normal or emergency power as indicated, 60 Hz nominal input.
 - d. Operating voltage dissipated by resistors shall not exceed 25% of ratings.
 - e. Operating voltage of capacitors shall not exceed 80% of rated voltage.
 - f. Operating loads and voltages on transistors and solid-state devices shall not exceed manufacturer's recommendation for normal full load operation.
 - g. Use electronic components of types and rating commonly available from stock of established commercial distribution.
- B. Regulatory Requirements
 - 1. The specifications and standards shall fully comply with the latest issue of the current code and standards.

2. All requirements of the Authority Having Jurisdiction (AHJ).

The FACP and associated field devices system shall comply with the following Underwriters Laboratories Inc. (UL) USA listing standards as applicable.

1. No. 38 Manually Actuated Signaling Boxes
2. No. 50 Cabinets and Boxes
3. No. 864 Control Units for Fire Protective Signaling Systems
4. No. 268 Smoke Detectors for Fire Protective Signaling Systems
5. No. 268A Smoke Detectors for Duct Applications
6. No. 346 Waterflow Indicators for Fire Protective Signaling Systems
7. No. 464 Audible Signaling Appliances
8. No. 521 Heat Detectors for Fire Protective Signaling Systems
9. No. 1638 Private Mode Emergency and General Utility Signaling
10. No. 1971 Visual Notification Appliances

1.6 WARRANTY

- A. For a period of two years from date of final acceptance, the system shall be under full guarantee for materials and labor at no cost to the Owner. The system shall be under a service contract with a technician authorized by the manufacturer. Replacement parts and labor shall be readily available during normal business hours while the service contract is in effect. A complete system inspection and test shall be performed at five months and again at eleven months after final acceptance. Tests shall include all smoke detector sensitivity settings.
- B. Conform to applicable provisions of the General Requirements.
- C. Service technicians and replacement components for the system shall be available locally from a service representative of the manufacturer who is able to provide evidence of technical training and authorization by the manufacturer.
- D. All component failures shall be remedied to the satisfaction of the Owner.
- E. A continuing service contract shall be offered at time of bid to commence at the expiration of warranty included with the system.

1.7 ACCEPTABLE MANUFACTURER

- A. All fire alarm system devices and equipment shall be manufactured with the one indicated on the drawing or approved equivalent. no other manufacturers will be accepted.
- B. All equipment, materials, accessories, devices, etc. covered by the specifications and/or noted on the contract drawings shall be new and unused and be UL listed for their intended use.
- C. All equipment provided shall be available for purchase from at least two authorized distributors within the service area.

1.8 MAINTENANCE:

Maintenance and testing shall be on a semi-annual basis or as required by the AHJ. A preventative maintenance schedule shall be provided by the contractor describing the protocol for preventative maintenance. The schedule shall include:

Systematic testing and complete inspection of the entire fire alarm system including control panels, field devices, and wiring terminations including smoke sensors, heat sensors, manual pull stations, sprinkler system switches, remote panels, power supplies, and terminal boxes, and all

other fire alarm accessories, in accordance with NFPA 72. Cleaning and adjusting of these devices shall be conducted at this time.

An inspection and test of system power supplies, batteries, circuit breakers, and fuses as well as a load test of the batteries shall be conducted in accordance with NFPA 72.

Placing the system into an alarm condition and checking each notification device for proper operation.

Removing devices from the FACP SLC circuit to ensure a trouble condition occurs.

Input and output mapping shall be tested to ensure proper sequence of operation.

Signal transmission shall be tested to the Monitoring Station.

A report showing the calibrated sensitivity of each of the systems smoke detectors shall be generated from the fire alarm control panel and verified to ensure all smoke detectors are within UL tolerance.

Following each periodic maintenance and test, the owner shall be provided with a detailed report of the test results including any deficiencies found.

PART 2 PRODUCT

2.1 MANUFACTURERS

- A. Fire Alarm Control Panel (FACP): Edwards
- B. Fire Alarm Power Supply: Edwards
- C. Area Smoke Detectors, Multi-Criteria Fire/CO Detector and Heat Detectors: Edwards
- D. Strobes, Combination Horn/strobe and Weatherproof Horn: Edwards

2.2 MATERIALS

- A. Main FACP or network node shall contain a microprocessor based Central Processing Unit (CPU) and power supply in an economical space saving single board design. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system-controlled devices.
- B. System Devices and components shall be provided as specified on the fire alarm equipment legend and as shown on associated electrical drawing.

2.3 COMPONENTS

EXISTING FIRE ALARM CONTROL PANEL (FACP)

- A. FACP shall be as indicated model on the drawing or approved equivalent.

2.1 System description

- A. The fire alarm system as outlined on the drawings, shall be a fire life safety system as manufactured by the panel indicated on the drawing. It shall be complete with all necessary

hardware, software and memory specifically tailored for this project.

B. All equipment needed for a complete operable system, (whether specifically indicated or not) shall be included in this section. It shall be the installing contractor's responsibility for a complete and operable system upon completion of this project.

2.2 Automatic alarm operations

A. The fire alarm system operation subsequent to the alarm initiation via pull station, smoke detector, heat detector, sprinkler flow switch, etc., shall be as follows:

1. All audible alarm indicating devices shall sound the temporal signal code in synchronization with each other, until silenced at the control panel or at the remote annunciator.
2. All visual alarm indicating devices shall flash per NFPA requirements in synchronization with each other, until reset at the control panel or at the remote annunciator.
3. Alarm audible devices and alarm visual devices shall operate on the same circuit
4. The alarm signals shall be inhibited from being silenced for a period of at least 1 minute after commencing operation. this rate is to be field programmable for actual AHJ requirements.
5. Display type and location of alarm per point on the main control panel lcd display.
6. Display type and location of alarm per point on remote lcd annunciator.
7. List on printer the time, date, type, and user defined message for each event printed.
8. Graphically display on the fireworks station, school diagram showing whole school, with graphic scrolling thru system prompts, down to point of alarm activation.
9. Subsequent alarms are to report to the main control panel and fireworks, shall indicate to the operator that a subsequent alarm is present, and also indicate the number of subsequent alarms.
10. Shut down all associated air handlers in alarm zone.

2.3 Automatic supervisory operation

A. All data, initiating, indicating and supervisory lines shall be constantly monitored for integrity. indicate opens, shorts, grounds, at main control panel and remote annunciator.

2.4 operation

A. During the normal state, the normal led (green) shall flash. the first line of the lcd shall display the time in (hh: mm: ss) as well as the number of active points (ap) and the number of disabled points (dp) in the system.

B. When the control panel goes into alarm condition, the normal led (green) extinguishes and the alarm led (red) shall light, the buzzer pulsates, and the lcd indicates the time, the number of messages waiting, the type of alarm, the point id number of devices, and the time that the alarm occurred. the second line is dedicated to the user specified message.

- C. To silence the panel buzzer, the operator shall press the local silence button and the buzzer will silence.
 - D. To silence the audible devices, the operator shall press the alarm silence button. a new alarm shall cause the audibles to resound.
 - E. During the trouble condition, the amber trouble led shall light, the normal led shall go out, and the buzzer shall pulsate. the display shall indicate the point id number of the device, the time the event occurred and up to a 40-character custom user description.
 - F. During the monitor or supervisory condition, the appropriate led shall light, the normal led shall go out, and the buzzer shall pulsate. the display shall indicate the point id number of the device, the time the event occurred and up to a 40-character custom user description.
- B. Fire Alarm Power Module:
- 1. The intelligent fire alarm power module shall be as indicated model on the drawing or approved equivalent. It delivers 6 amps of notification appliance circuit power and built-in synchronization. Its switch mode power supply design is up to 50% more efficient than competitive linear mode power supplies.
 - 2. The power supply is a 6-amp notification power expander that provides its own AC power connection, battery charging circuit, and backup battery for use with the same manufacturer series fire alarm control panels (FACPs). The power supply is the cost-effective solution for powering notification appliances required by the Americans with Disabilities Act (ADA). It has built-in ANSI cadence pattern. The output circuits can be programmed as notification appliance circuits, or as auxiliary power (configurable for constant, resettable, or door holder power).
- C. Intelligent Photoelectric Smoke Detector
- 1. The intelligent photoelectric smoke detector shall be as indicated model on the drawing or approved equivalent and shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
- D. Intelligent Thermal Detectors
- 1. The intelligent thermal detectors be as indicated model on the drawing or approved equivalent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. A high heat thermal detector rated at 190 degrees Fahrenheit shall also be available. The thermal detectors shall connect via two wires to the fire alarm control panel signaling line circuit.
- E. Multi-Criteria Fire/CO Detector
- 1. It is a plug-in, addressable device that provides both fire and carbon monoxide (CO) detection. The detector combines four separate sensing elements to sense multiple components of a fire: smoke, CO, light/flame, and heat. This approach enables enhanced sensitivity to real fire with heightened immunity to nuisance particulates. For CO, the detector's electrochemical sensing cell creates a separate signal for life safety CO detection.
 - 2. Multiple sensors and communication can greatly reduce nuisance alarms compared to single sensing methods. Sophisticated algorithms maximize the advantages of all four sensor types creating our best detection strategy offering heightened immunity to nuisance particulate and enhanced sensitivity to real fire.
 - 3. UL models meet UL 268 7th edition and UL 521 listing requirements for fire detection and UL 2075 standard for system-connected life safety carbon monoxide detection.
 - 4. B200S series intelligent sounder bases are recommended for use. These bases can generate either a Temp 3 pattern for fire or a Temp 4 pattern for CO alarm indication.

The B200S series bases recognize the System Sensor synchronization protocol for use as a component of the general signal — along with other System Sensor Audible/Visible devices — when connected to a power supply or Fire Alarm Control Panel (FACP) output capable of generating the System Sensor synchronization pulses.

F. Control Relay Module:

1. The Control Relay is intended for use in intelligent, two-wire systems where the individual address of each module is selected using the built-in rotary switches. It allows a compatible control panel to switch discrete contacts by code command. The relay contains two isolated sets of Form-C contacts, which operate as a DPDT switch and are rated in accordance with the table in the manual. Circuit connections to the relay contacts are not supervised by the module. The module also has a panel-controlled LED indicator.

G. Intelligent Monitor Module:

1. The monitor module indicated on the drawing is an addressable monitor module for use with Honeywell Silent Knight Series fire alarm control panels (FACPs). The monitor module is intended for use in intelligent, two-wire systems, where individual address of each module is selected using the built-in rotary switches.
2. It supports Class A supervised or Class B supervised wiring to the load device. Conventional 4-wire smoke detectors can be monitored for alarm and trouble conditions.

H. Ceiling Mounted Strobe

1. The notification appliances shall be as indicated model or approved equivalent model as Visual Strobe appliances for ceiling-mount applications with a low-profile design or approved equals. The Strobes shall be listed for UL Standard 1971 (Emergency Devices for the Hearing-Impaired) for Indoor Fire Protection Service.
2. The Series shall be Restriction of Hazardous Substances (RoHS) compliant and contain no mercury or other hazardous substances.
3. All Series shall meet the requirements of FCC Part 15 and ICES-003.
4. All inputs shall be compatible with standard reverse polarity supervision of circuit wiring by a Fire Alarm Control Panel (FACP) with the ability to operate from 16 to 33 VDC.
5. The Strobe appliances shall produce a flash rate of one (1) flash per second over the Regulated Voltage Range and shall incorporate a Light Emitting Diode (LED) as the light source with a rugged Lexan® lens. The appliances shall be of low current design. The LED strobe flash duration shall be 20 ms. Where multi-candela appliances are specified, the strobe intensity shall have 4 field selectable settings at 15, 30, 75, 95 candela for ceiling-mount applications. The selector switch for selecting the candela shall be tamper resistant. Appliances with candela settings shall show the candela selection in a visible location at all times when installed.
6. The Strobe mounting options shall include Ceiling backboxes, 4" square, 1 1/2" or 2 1/8" deep and 4" Octagonal, 1 1/2" or 2 1/8" deep. Two wire appliance wiring shall be capable of directly connecting to the mounting base. Removal of an appliance shall result in a supervision fault condition by the Fire Alarm Control Panel (FACP).
7. All notification appliances shall be backwards compatible.
8. The ceiling models shall have a low-profile measuring.
9. When synchronization is required, the appliance shall be compatible with Sync Modules, PS Power Supplies, or other manufacturer's panels with built-in manufacturer Patented Sync Protocol. The strobes shall not drift out of synchronization at any time during operation. If the sync protocol fails to operate, the strobe shall revert to a non-synchronized flash-rate and still maintain (1) flash per second over its Regulated Voltage Range. The appliance shall also be designed so that the audible signal may be silenced while maintaining strobe activation when used with patented sync protocol.

- I. Combination Horn Strobes
 1. The Horn Strobes are designed for high efficiency sound output for indoor applications. The product line features intelligible communications with crisp, clear and tone signaling, ideal for mass notification.
 2. Providing a sleek aesthetic appearance, the wall and ceiling appliances feature dual voltage (25/70 VRMS) capability and field-selectable taps from 1/8 to 2 watts. For faster and easier installation, the low-profile design incorporates a mounting plate, and each model has a built-in level adjustment feature and Snap-On cover with no visible mounting screws.
 3. For visible signaling to meet the hearing impaired, the E horn Strobe models incorporate the low current draw of the Strobes.
 4. Ceiling mount models are available in multi-candela ceiling strobe with field selectable intensities of 15/30/75/95/110/115cd or the high intensity strobe with field selectable 135/150/177/185cd.
 5. The strobe portion of all Horn Strobes may be synchronized when used in conjunction with the Sync Modules, Power Supplies or other manufacturers panels incorporating the manufacturer Patented Sync Protocol.
Synchronized strobes offer an easy way to comply with ADA recommendations \ concerning photosensitive epilepsy.
 6. Horn Strobes are UL Listed for indoor use under Standard 1971 (Signaling Devices for the Hearing-Impaired) and Standard 1480. All inputs employ IN/OUT wiring terminals for fast installation using #12 to #18 AWG wiring.
 7. All models shall have listed sound output of up to 87 dB at 10 feet and a listed frequency response of 400 to 4000 Hz.
 8. When synchronization is required, the strobe portion of the appliance shall be compatible with sync modules or the Power Supplies with built-in Patented Sync Protocol. The strobes shall not drift out of synchronization at any time during operation. If the sync module or Power Supply fails to operate, (i.e., contacts remain closed), the strobe shall revert to a non-synchronized flash rate.

- J. Weatherproof Horn
 1. Weatherproof notification appliances shall be UL listed for outdoor use. The appliances shall be available for optional wall mounting or ceiling mounting to weatherproof backboxes using either exposed conduit, concealed conduit, or semi-flush mounting to a recessed electrical box in walls or ceilings using indicated manufacturer mounting accessories.
 2. Wall-mount outdoor notification appliances can be used indoors or outdoors in wet or dry applications, and can provide reliable operation from -40°F to 151°F. Provide a broad frequency response range, low harmonic distortion and maintain a high sound pressure level at all tap settings.
 3. Field-selectable settings, including candela, voltage and power settings, and automatic selection of 12- or 24-volt operation enable installers to easily adapt devices to meet requirements.
 4. Weatherproof audibles shall be System sensor models or approved equals. The devices shall be able to produce a continuous output or a temporal code-3 output that can be synchronized.
 5. WP notification appliances shall be listed to Underwriters Laboratories Standard S4048 for outdoor fire protective signaling systems. Devices shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature from -40°F to 150.8°F and shall have power taps and wattage settings that are selected by rotary switches. The WP notification appliances must be installed with its weatherproof back box in order to remain outdoor approved per UL listing S4048 and shall be suitable for use in air handling spaces and wet environments.

- K. Battery
 - 1. The battery shall have sufficient capacity to power the fire alarm system for no less than twenty-four hours plus 15 minutes of alarm upon a normal AC power failure.
 - 2. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.
 - 3. If necessary, to meet standby requirements, external battery and charger systems may be used.

PART 3 EXECUTION

3.1 COORDINATION

- A. Refer to the electrical and mechanical drawings and specifications to determine quantities and location of devices and required scope of work and coordinate work with mechanical and electrical installers. Provide function described under mechanical section Sequence of Control, for fire and/or emergency conditions. Submit proposed interconnection to elevator supplier. Submit conduit and pathing requirements to electrical installer. For self-contained door release, coordinate with door supplier.

3.2 GENERAL

- A. Comply with all applicable paragraphs in Section 26 05 00: Common Work Results for Electrical, apply as though repeated herein
- B. Install system(s) in accordance with manufacturer's instructions.
- C. Include services of certified technicians to supervise installation, provide adjustments, provide final connections, system testing and system training to Owner Representative

3.3 INSTALLATION

The complete system shall be installed by one (1) contractor and the installing contractor must be a certified dealer of the specified system. No subcontractors, to the awarded proposing contractor, will be allowed to install any portion of this system Including, but not limited to:

- 1. Wiring
 - 2. Field device installation
 - 3. System programming
 - 4. FACP installation
 - 5. Remote power supply installation
- A. The installing contractor shall install the network fire alarm system in as instructed by the manufacturer's instructions.
 - B. Installation shall be in accordance with the CEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
 - C. 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.
 - D. All fire detection and alarm system devices, control panels shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

- E. 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.
- F. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold-water pipe or grounding rod. The control panel enclosure shall feature a quick removal chassis to facilitate rapid replacement of the FACP electronics.

3.4 GROUNDING

- A. All equipment to be grounded by means of green ground wire to "U" contact of duplex receptacles and bonded to ground provided under 26 05 26: Grounding and Bonding of Electrical Systems.

3.5 INSPECTION

- A. Systems to meet all the requirements of the CSFM and IOR and AHJ and shall be approved thereby before installation and prior to final acceptance.
- B. Closeouts:
 - 1. It is the intent of these specifications and of the architect/engineer that a continued program of system maintenance be continued by the owner in compliance with NFPA Standard 72H. It is mandatory that the installing contractor provide such services and make available these services to the owner upon completion of the project.
 - 2. As part of the closeout documents, fire alarm contractor will provide owner with AutoCAD as built drawings indicating locations of devices, routing of wiring, and panel information. All room numbers indicated on final close out documents and all panel settings shall be listed by actual building room numbers and not by room number indicated on construction documents. CAD files shall be AutoCAD 2004 or later. Provide the owner with one Mylar plot of each drawing and two blue line prints of each drawing. Provide the owner with electronic versions of the as-built CD's.
 - 3. Locate next to building FACP and other fire alarm panels.
 - 4. A building graphic shall be provided mounted in aluminum-extruded frame with plexi-glass front. Graphic shall locate all fire alarm devices, power supplies, and FACP.
 - 5. State FML-005 certificate shall also be framed and mounted near the fire alarm panel. Fire alarm panel shall have white FM required installation sticker attached to it.
- C. Graphic shall include actual room numbers posted as part of the building graphics package, include as part of substantial completion requirement.

3.6 LOCATION

- A. Before installation, verify exact location of control equipment and outlets. The Owner reserves the right to relocate system components within a radius of 10' at no increase in cost before rough-in work is started for the respective component.

3.7 WIRING

- A. All fire alarm wiring shall be new.
- B. Furnish all conductors, equipment, terminal strips, etc., and labor to install a complete and operable system. All cable conductors shall be color coded and numbered for identification at all terminals. Green shall be for grounding conductor only. Use red insulation and or red jacketing on all fire alarm cable.
- C. All wiring shall be in accordance with NFPA 72, the California Electrical Code, Local Codes, and article 760 of NFPA Standard 70. All wiring sizes shall conform to recommendations of the equipment manufacturer, and as indicated on the engineered shop drawings.
- D. All wire shall be U.L. Listed FPL for limited energy (300V) and fire alarm applications and shall be installed in conduit. Limited energy FPLP or MPP wire may be run open in return air ceiling plenums provided such wire is U.L. Listed for such applications and is of the low smoke producing fluorocarbon type and complies with CEC Article 760 if so, approved by the local authority having jurisdiction.
- E. No A.C. wiring or any other wiring shall be run in the same conduit as fire alarm wiring.
- F. Wiring used for the multiplex communication circuit (SLC) shall be twisted and support a minimum wiring distance of 10,000 feet when sized at 12 AWG. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit. Shielded wire shall not be required.
- G. The fire alarm control panel shall be capable of T-tapping NFPA Style 4 (Class B) Signaling Line Circuits (SLCs). Systems which do not allow or have restrictions in, for example, the number of T-taps, length of T-taps etc., is not acceptable.
- H. Contractor shall provide a service loop located above each device installed on the entire project. The service loop shall be a minimum of 5'.
- I. Contractor shall provide a service loop located above each type of panel installed. The service loop shall be a minimum of 10', but shall have enough length to allow for the panel to be relocated to any wall within the room that panel is located in.
- J. All service loops shall be installed in the accessible ceiling that is nearest to each device and panel. No service loops shall be installed in open spaces or non-accessible spaces

3.8 TERMINAL BOXES, JUNCTION BOXES AND CABINETS:

- A. All boxes and cabinets shall be UL listed for their use and purpose.

3.9 CONDUIT / RACEWAY:

- A. All wire shall be installed in an approved conduit/raceway system (except where permitted by NEC and the local authority having jurisdiction). Maximum conduit "fill" shall not exceed 40% per CEC.
- B. Conduit and raceway system shall be installed as specified under the general electrical section of the specifications, and per CEC, local, and state requirements.
- C. Minimum conduit size shall be 3/4" (19.1 mm). Install conduit per engineered shop drawings.

- D. Systems utilizing open wiring techniques with low smoke plenum cable shall provide conduit in all inaccessible locations, inside concealed walls, all mechanical/electrical rooms, or other areas where wiring might be exposed or subject to damage.
- E. All vertical wiring and all main trunk/riser wiring shall be installed in a complete raceway/conduit system. All riser boxes shall be adequately sized for the number of conductors traversing the respective box as well as the number of terminations required.
- F. 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 CEC Article 760-29.
- G. 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.
- H. Conduit shall not enter the fire alarm control panel or any other remotely mounted control panel equipment or back boxes, except where conduit entry is specified by the FACP manufacturer.
- I. All wiring associated with smoke control system shall be installed in conduit per current adopted codes regardless of voltages or ratings.

3.10 TESTING

- A. After all equipment specified herein for each system has been installed and is in operating condition, conduct performance tests to determine if the installation and components comply with these specifications. Furnish competent personnel, all test material and approved test instruments and conduct the tests under supervision of factory personnel, in the presence of the Engineer, the building and fire inspecting agencies:
 - 1. The contractor's job foreman, in the presence of a representative of the manufacturer, a representative of the owner, and the fire department shall operate every installed device to verify proper operation and correct annunciation at the control panel.
 - 2. At least on half of all tests shall be performed on battery standby power.
 - 3. Where application of heat would destroy any detector, it may be manually activated.
 - 4. The signaling line circuits and notification appliance circuits shall be opened in at least two (2) locations to verify the presence of supervision.
 - 5. When the testing has been completed to the satisfaction of the contractor representative IOR, representatives of the manufacturer and owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the owner and the authority having jurisdiction.
 - 6. The contractor shall leave the fire alarm system in proper working order, and, without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within two years from the date of final acceptance by the awarding authority.
 - 7. The local responding fire department must be notified prior to the final test in accordance with local requirements and when requested, participate in system testing and evaluation.

3.11 WALK TEST

- A. Notify Owner, Architect and Engineer when system is 100 percent operational. Schedule walk-through of the entire facility and verify that each initiating and each indicating device is operating properly.

- B. Provide report at conclusion of walk through certifying all fire alarm devices are working.
- C. Walk test shall include a representative from owner maintenance department.
- D. Walk test to show in a printed report all AHU shutdown, strobes/horns, heat and smoke detectors. Report shall list all devices by approximate location to rooms, and device number.

3.12 SOFTWARE

- A. Installer shall provide a backup copy of the installed program database (on CD) upon completion of the project. They shall also provide the current version of system software, for the panel provided, on CD.

3.13 REPORT

- A. Prepare written report of final test results, signed by witnessing parties. Submit to the Engineer in triplicate for final approval.

END OF SECTION 28 31 00

SECTION 32 13 13 CONCRETE PAVING

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. The Contractor shall furnish all materials for concrete in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other work as required to produce finished concrete, in accordance with the requirements of the Contract Documents.
- B. Provide curb cuts meeting the accessibility requirements of the California Code of Regulations (CCR) Title 24, Part 2, 1127B.5, and ramps complying with CCR, T24, CCR, Part 2, 1003.3.4 and 11B-406.
- C. Portland cement concrete paving shall be stable, firm, and slip resistant and shall comply with CBC Sections 11B-302 and 11B-403.
- D. The following types of concrete shall be covered in this Section:
 - 1. Portland cement concrete pavement, cement walks, flatwork, curbs, gutters, retaining curbs, swales, trash pick-up areas, ramps, mowing strips, fence post footings, sliding gate concrete, catch basins, pipe bedding and encasements, transition structures, flagpoles and light standard bases and footings, splash blocks, parking bumpers and equipment pads.
- E. Reference Standards:
 - 1. The work provided herein shall conform to and be in accordance with the Contract Plans, General Conditions/Specifications and Special Provisions, as well as the Standard Specifications for Public Works Construction (GREENBOOK), Current Edition, adopted by the Southern California Chapter, American Public Works Association; herein referred to as the "Standard Specifications".
 - 2. Comply with the current provisions of the following Codes and Standards:
 - a. UU-B-790: Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellant and Fire Resistant).
 - b. ACI 301: Specifications for Structural Concrete for Buildings.
 - c. ACI 318: Building Code Requirements for Reinforced Concrete.
 - d. ASTM C31: Practices for Making and Curing Concrete Test Specimens in the Field.
 - e. ASTM C33: Specification for Concrete Aggregates.
 - f. ASTM C39: Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - g. ASTM C40: Test Method for Organic Impurities in Fine Aggregates for Concrete.
 - h. ASTM C42: Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - i. ASTM C78: Specification for Flexural Strength.
 - j. ASTM C88: Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate.
 - k. ASTM C94: Specification for Ready-Mixed Concrete.
 - l. ASTM C114: Method for Chemical Analysis of Hydraulic Cement.

SECTION 32 17 10 - PAVEMENT MARKINGS AND SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Requirements including but not limited to:
 - 1. Pavement markings for parking stalls and drives including special pavement markings.
 - 2. Accessible signage.
 - 3. Wheel stops.
 - 4. Accessories necessary for a complete installation.
- B. Pavement markings, signage, wheelstops, and guardrails are affected by Alternates.

1.3 SUBMITTALS

- A. Product Data: Provide manufacturer technical data for each type of pavement marking materials including recommendations for application, including limitations, safety, and environmental requirements, application rates, dry film thickness (DFT), and equipment required for application and indicate compliance with applicable regulations regarding toxic and hazardous materials.
- B. Shop Drawings: Indicate layout of pavement markings.
 - 1. Submit pavement marking plan indicating lane separations, directional markings, and defined parking spaces. Note dedicated handicapped spaces with international graphics symbol.
 - 2. Submit site plan with location of directional, parking, and accessible signage.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Environmental Regulations: Comply with local laws, rules, and regulations of governmental authorities having jurisdiction.
 - a. Comply with Environmental Protection Agency (EPA) regulations for volatile organic compounds (VOCs).
 - b. Comply with South Coast Air Quality Management District (SCAQMD) regulations.
 - 2. Accessibility Requirements: Comply with applicable requirements.
 - a. U.S. Architectural and Transportation Barriers Compliance Board Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (2004 ADAAG) Standards for Accessible Design 2010.
 - b. ICC/ANSI A117.1 Accessible and Useable Building and Facilities.
 - c. IBC Chapter 11 Accessibility.
 - d. California Building Code Accessibility Standards, CBC 2022, Chapter 11B
- B. Source Limitations: Obtain traffic and pavement coatings from a single manufacturer.
- C. Environmental Performance:
 - 1. VOC Content: Provide pavement marking paint materials complying with limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) for pavement marking paint: 150 g/L.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels showing the following information:
 - 1. Manufacturer's brand name.
 - 2. Type of material.
 - 3. Directions for storage.
 - 4. Date of manufacture and shelf life.
 - 5. Lot or batch number.
 - 6. Mixing and application instructions.
 - 7. Color.
- B. Store materials in a clean, dry location protected from exposure to direct sunlight. In storage areas, maintain environmental conditions within range recommended in writing by manufacturer.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Apply striping and marking within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply coatings to damp or wet substrates, when temperatures are below 40 degrees F (5 degrees C), when relative humidity exceeds 85 percent, or when temperatures are less than 5 degrees F (3 degrees C) above dew point.
 - 1. Do not apply coatings in snow, rain, fog, or mist, or when weather conditions are imminent during the application and curing period. Apply only when frost free conditions occur throughout the depth of substrate.
- B. Take precautions to avoid effects of wind drift during the application of liquid materials.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pavement Marking Paints and Coatings: Water based alkyd resin ready mixed, complying with AASHTO M 248, Type N; color required by application.
 - 1. Red: Safety and restricted marking (fire lanes and curb markings).
 - 2. Blue: Accessible parking stall graphic and disability markings.
 - 3. White: Traffic lanes, parking stalls.
 - 4. Manufacturers: Subject to compliance with requirements, provide pavement marking paint and coatings by Tnemec Paints or Ameron Paints.
- B. Accessible Signage:
 - 1. Parking Stalls: 14 gauge sheet steel with reflectorized porcelain white beaded lettering and symbol on brown background, minimum 80 square inches.
 - a. Symbol: International Symbol of Accessibility.
 - b. Required Verbiage: Reserved Parking, Van Accessible.
 - c. Post Mounted: 2" x 2" x 1/8 inch galvanized steel pipe complying with ASTM A 53 or ASTM A 120; theft proof fasteners; set in concrete footing.
 - d. Mounting Posts: Galvanized tube steel, ASTM A 53 or ASTM A 120, seamless, 2" x 2" x 1/8".
 - 2. Verbiage:
 - a. Van Accessible.
 - b. Unauthorized vehicles parked in designated accessible spaces not displaying distinguished placards or license plates issued for persons with disabilities may be towed at Owner expense. Towed vehicles may be reclaimed at (to be determined) or by telephoning (to be determined).

- C. Prefabricated Wheel Stops: Low profile stops fabricated from 3500 psi portland cement, reinforced with #4 galvanized steel reinforcing, radiused edge. Size: 6 feet long by 5 inches high (125 mm) by 6 inches (150 mm) wide. Provide holes for countersunk anchor bolts and grouting.
- D. Mounting Posts: Galvanized tube steel, ASTM A 53 or ASTM A 120, seamless, 2" x 2" x 1/8".
- E. Sealants: Refer to Section 079200.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements and for conditions affecting performance of pavement marking paints.
 - 1. Verify compatibility with and suitability of substrates.
 - 2. Commence application after minimum concrete curing and drying period recommended by pavement marking paint manufacturer has passed, after unsatisfactory conditions have been corrected, and after surfaces are dry.
 - 3. Verify substrates are visibly dry and free of moisture.
 - a. Test for moisture vapor transmission by plastic sheet method according to ASTM D 4263.
 - b. Test for moisture content by measuring with an electronic moisture meter.
 - 4. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Layout chalk markings at locations and to dimensions indicated on approved shop drawings. Use stencils, templates, forms, and guidelines for word markings, letters, numerals, and symbols.
- B. Verify pavement surface is dry, free of dirt, grease, oil, acids, latence, or foreign matter that will reduce the bond between the paint and pavement. Clean contaminated areas with solution of trisodium phosphate (10% Na₃PO₄ by weight) or approved cleaning solution. Rinse with clean water and dry prior to application of paint.
 - 1. Bituminous Surface: Allow bituminous pavement minimum 10 days to cure prior to application of paint. If paint curls or discolors, removed paint, prepare surface, and recoat.
 - 2. Portland Cement Surface: Allow portland cement to cure minimum 28 days. Test for moisture prior to application of paint.
- C. Concrete Substrates: Mechanically abrade concrete surfaces to a uniform profile according to ASTM D 4259. Do not acid etch.
 - 1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
 - 2. Remove concrete fins, ridges, and other projections.
 - 3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
 - 4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.

3.3 APPLICATION

- A. Pavement Marking: Allow paving to age for a minimum of 90 days before starting pavement marking. Sweep and clean surface to eliminate loose material and dust.
 - 1. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).
 - 2. Apply at recommended application rate and surface temperature. Thinner is not permitted.

3. Apply graphic symbols and lettering with paint resistant, die cut stencils, firmly secured to pavement. Mask extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.
 4. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal. (0.72 kg/L).
- B. Striping: Provide straight edged uniform line width of 4 inches.
1. Stall Divisions: Provide standard size parking stalls with white striping.
 2. Arrows and Pavement Signage: Apply directional markings and stencils in accordance with manufacturers written instructions.
 3. Fire Lane Markings: Comply with local Fire Marshal's requirements. Use approve stencils for lettering and graphics.
- C. Accessibility Signage: Install in compliance with California Building Code Accessibility Standards, BC 2022, Chapter 11B.
1. Post Mounted Signage: Center accessible signage at interior end of parking space with bottom edge of sign minimum 80 inches above finished grade. Set at each accessible stall where wall mounted signage is not appropriate.
 2. Wall Mounted Signage: Center accessible signage at interior end of parking space with bottom edge of sign minimum 42 inches above finished grade. Set at each accessible parking stall where post mounted signage is not practical.
 3. Pavement Signage: Apply accessible symbol at each accessible parking stall. Center 3'0" x 3'0" square International Accessible Symbol (white reflectorized symbol on blue background) at exterior end of each accessible stall. On bituminous surfaces, paint additional white border around blue background square.
- D. Wheel Stops: Anchor wheel stops to concrete or asphalt pavement to comply with manufacturer's written instructions.

3.4 TOLERANCES

- A. Width of Stripe: Maximum variance of +/- 1/4 inch.
- B. Alignment of Stripe: Maximum deviation 1/2 inch in 50 feet.

3.5 CLEANUP

- A. Remove overspray, drips, and splattered paint from adjacent surfaces as soon as possible. Clean spillage using cleaning agents and procedures recommended by manufacturer of affected construction.
- B. Remove excess materials and debris from site and legally dispose.

END OF SECTION

DSA 103-22: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS, 2022 CBC

Application Number:
03-123048

School Name:
Walnut Grove Intermediate School
Increment Number:

School District:
West Covina Unified School District

Date Created:
2023-09-22 12:11:48

2022 CBC

IMPORTANT: This form is only a summary list of structural tests and some of the special inspections required for the project. Generally, the structural tests and special inspections noted on this form are those that will be performed by the Geotechnical Engineer of Record, Laboratory of Record, or Special Inspector. The actual complete test and inspection program must be performed as detailed on the DSA approved documents. The appendix at the bottom of this form identifies work NOT subject to DSA requirements for special inspection or structural testing. The project inspector is responsible for providing inspection of all facets of construction, including but not limited to, special inspections not listed on this form such as structural wood framing, high-load wood diaphragms, cold-formed steel framing, anchorage of non-structural components, etc., per Title 24, Part 2, Chapter 17A (2022 CBC).

****NOTE:** Undefined section and table references found in this document are from the CBC, or California Building Code.

KEY TO COLUMNS

1. TYPE	2. PERFORMED BY
<p>Continuous – Indicates that a continuous special inspection is required</p> <p>Periodic – Indicates that a periodic special inspection is required</p> <p>Test – Indicates that a test is required</p>	<p>GE (Geotechnical Engineer) – Indicates that the special inspection shall be performed by a registered geotechnical engineer or his or her authorized representative.</p> <p>LOR (Laboratory of Record) – Indicates that the test or special inspection shall be performed by a testing laboratory accepted in the DSA Laboratory Evaluation and Acceptance (LEA) Program. See CAC Section 4-335.</p> <p>PI (Project Inspector) – Indicates that the special inspection may be performed by a project inspector when specifically approved by DSA.</p> <p>SI (Special Inspection) – Indicates that the special inspection shall be performed by an appropriately qualified/approved special inspector.</p>

DSA 103-22: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (CONCRETE), 2022 CBC

Table 1705A.3; ACI 318-19 Sections 26.12 & 26.13

Application Number: 03-123048

School Name: Walnut Grove Intermediate School

DSA File Number: 19-110

School District: West Covina Unified School District

Date Created: 2023-09-22 12:11:48

C1. CAST-IN-PLACE CONCRETE				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify use of required design mix.	Periodic	SI	Table 1705A.3 Item 5, 1910A.1.
<input checked="" type="checkbox"/>	b. Identify, sample, and test reinforcing steel.	Test	LOR	1910A.2; ACI 318-19 Ch.20 and Section 26.6.1.2; DSA IR 17-10. (See Appendix (end of this form) for exemptions.)
<input checked="" type="checkbox"/>	c. During concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	Test	LOR	Table 1705A.3 Item 6; ACI 318-19 Sections 26.5 & 26.12.
<input checked="" type="checkbox"/>	d. Test concrete (f_c).	Test	LOR	1905A.1.17; ACI 318-19 Section 26.12.
<input type="checkbox"/>	e. Batch plant inspection:	See Notes	SI	Default of 'Continuous' per 1705A.3.3. If approved by DSA, batch plant inspection may be reduced to 'Periodic' subject to requirements in Section 1705A.3.3.1, or eliminated per 1705A.3.3.2. See IR 17-13. (See Appendix (end of this form) for exemptions.)
<input type="checkbox"/>	f. Welding of reinforcing steel.	Provide special inspection per STEEL, Category S/A4(d) & (e) and/or S/A5(g) & (h) below.		

C2. PRESTRESSED / POST-TENSIONED CONCRETE (IN ADDITION TO SECTION C1):				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Sample and test prestressing tendons and anchorages.	Test	LOR	1705A.3.4, 1910A.3
<input type="checkbox"/>	b. Inspect placement of prestressing tendons.	Periodic	SI	1705A.3.4, Table 1705A.3 Items 1 & 9.

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Table 1705A.3; ACI 318-19 Sections 26.12 & 26.13

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	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	c. Verify in-situ concrete strength prior to stressing of post-tensioning tendons.	Periodic	SI	Table 1705A.3 Item 13. Special inspector to verify specified concrete strength test prior to stressing.
<input type="checkbox"/>	d. Inspect application of post-tensioning or prestressing forces and grouting of bonded prestressing tendons.	Continuous	SI	1705A.3.4, Table 1705A.3 Item 9; ACI 318-14 Section 26.13

C3. PRECAST CONCRETE (IN ADDITION TO SECTION C1):

	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Inspect fabrication of precast concrete members.	Continuous	SI	ACI 318-19 Section 26.13.
<input type="checkbox"/>	b. Inspect erection of precast concrete members.	Periodic	SI*	Table 1705A.3 Item 10. * May be performed by PI when specifically approved by DSA.
<input type="checkbox"/>	c. For precast concrete diaphragm connections or reinforcement at joints classified as moderate or high deformability elements (MDE or HDE) in structures assigned to Seismic Design Category D, E or F, inspect such connections and reinforcement in the field for: 1. Installation of the embedded parts 2. Completion of the continuity of reinforcement across joints. 3. Completion of connections in the field.	Continuous	SI	Table 1705A.3; ACI 318-19 Section 26.13.1.3; ACI 550.5
<input type="checkbox"/>	d. Inspect installation tolerances of precast concrete diaphragm connections for compliance with ACI 550.5.	Periodic	SI	Table 1705A.3; ACI 318-19 Section 26.13.1.3; ACI 550.5

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Table 1705A.3; ACI 318-19 Sections 26.12 & 26.13

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C4. SHOTCRETE (IN ADDITION TO SECTION C1):				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Inspect shotcrete placement for proper application techniques.	Continuous	SI	1705A.3.9, Table 1705A.3 Item 7, 1908A.1, 1908A.2, 1908A.3. See ACI 506.2-13 Section 3.4, ACI 506R-16.
<input type="checkbox"/>	b. Sample and test shotcrete (f'_c).	Test	LOR	1908A.2, 1705A.3.9

C5. POST-INSTALLED ANCHORS:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Inspect installation of post-installed anchors	See Notes	SI*	1617A.1.19, Table 1705A.3 Item 4a (Continuous) & 4b (Periodic), 1705A.3.8 (See Appendix (end of this form) for exemptions). ACI 318-14 Sections 17.8 & 26.13. * May be performed by the project inspector when specifically approved by DSA.
<input checked="" type="checkbox"/>	b. Test post-installed anchors.	Test	LOR	1910A.5. (See Appendix (end of this form) for exemptions.)

C6. OTHER CONCRETE:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a.			

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1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-20; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

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S/A1. STRUCTURAL STEEL, COLD-FORMED STEEL AND ALUMINUM USED FOR STRUCTURAL PURPOSES				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify identification of all materials and: • Mill certificates indicate material properties that comply with requirements. • Material sizes, types and grades comply with requirements.	Periodic	*	Table 1705A.2.1 Item 3a 3c, 2202A.1; AISI S100-20 Section A3.1 & A3.2, AISI S240-20 Section A3 & A5, AISI S220-20 Sections A4 & A6. * By special inspector or qualified technician when performed off-site.
<input checked="" type="checkbox"/>	b. Test unidentified materials	Test	LOR	2202A.1.
<input type="checkbox"/>	c. Examine seam welds of HSS shapes	Periodic	SI	DSA IR 17-3.
<input checked="" type="checkbox"/>	d. Verify and document steel fabrication per DSA-approved construction documents.	Periodic	SI	Not applicable to cold-formed steel light-frame construction, except for trusses (1705A.2.4).
<input type="checkbox"/>	e. Buckling restrained braces.	Test	LOR	Testing and special inspections in accordance with IR 22-4.

S/A2. HIGH-STRENGTH BOLTS:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a. Verify identification markings and manufacturer's certificates of compliance conform to ASTM standards specified in the DSA-approved documents.	Periodic	SI	Table 1705A.2.1 Items 1a & 1b, 2202A.1; AISC 360-16 Section A3.3, J3.1, and N3.2; RCSC 2014 Section 1.5 & 2.1; DSA IR 17-8 & DSA IR 17-9.
<input type="checkbox"/>	b. Test high-strength bolts, nuts and washers.	Test	LOR	Table 1705A.2.1 Item 1c, 2213A.1; RCSC 2014 Section 7.2; DSA IR 17-8.
<input type="checkbox"/>	c. Bearing-type ("snug tight") connections.	Periodic	SI	Table 1705A.2.1 Item 2a, 1705A.2.6, 2204A.2; AISC 360-16 J3.1, J3.2, M2.5 & N5.6; RCSC 2014 Section 9.1; DSA IR 17-9.
<input type="checkbox"/>	d. Pretensioned and slip-critical connections.	*	SI	Table 1705A.2.1 Items 2b & 2c, 1705A.2.6, 2204A.2; AISC 360-16 J3.1, J3.2, M2.5 & N5.6; RCSC 2014 Sections 9.2 & 9.3; DSA IR 17-9. * "Continuous" or "Periodic" depends on the tightening method used.

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1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

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S/A3. WELDING:				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Verify weld filler material identification markings per AWS designation listed on the DSA-approved documents and the WPS.	Periodic	SI	1705A.2.5, Table 1705A.2.1 Items 4 & 5; AWS D1.1 and AWS D1.8 for structural steel; AWS D1.2 for Aluminum; AWS D1.3 for cold-formed steel; AWS D1.4 for reinforcing steel; DSA IR 17-3.
<input checked="" type="checkbox"/>	b. Verify weld filler material manufacturer's certificate of compliance.	Periodic	SI	DSA IR 17-3.
<input checked="" type="checkbox"/>	c. Verify WPS, welder qualifications and equipment.	Periodic	SI	DSA IR 17-3.

S/A4. SHOP WELDING (IN ADDITION TO SECTION S/A3):				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds.	Continuous	SI	Table 1705A.2.1 Items 5a.1 4; AISC 360-16 (and AISC 341-16 as applicable); DSA IR 17-3.
<input type="checkbox"/>	b. Inspect single-pass fillet welds ≤ 5/16", floor and roof deck welds.	Periodic	SI	1705A.2.2, Table 1705A.2.1 Items 5a.5 & 5a.6; AISC 360-16 (and AISC 341-16 as applicable); DSA IR 17-3.
<input type="checkbox"/>	c. Inspect welding of stairs and railing systems.	Periodic	SI	1705A.2.1; AISC 360-16 (and AISC 341-16 as applicable); AWS D1.1 & D1.3; DSA IR 17-3.
<input type="checkbox"/>	d. Verification of reinforcing steel weldability other than ASTM A706.	Periodic	SI	1705A.3.1; AWS D1.4; DSA IR 17-3. Verify carbon equivalent reported on mill certificates.
<input type="checkbox"/>	e. Inspect welding of reinforcing steel.	Continuous	SI	Table 1705A.2.1 Item 5b, 1705A.3.1, Table 1705A.3 Item 2, 1903A.8; AWS D1.4; DSA IR 17-3.

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1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; AISI S100-20; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

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Test or Special Inspection		Type	Performed By	Code References and Notes
S/A5. FIELD WELDING (IN ADDITION TO SECTION S/A3):				
Test or Special Inspection		Type	Performed By	Code References and Notes
<input checked="" type="checkbox"/>	a. Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds.	Continuous	SI	Table 1705A.2.1 Items 5a.1 4; AISC 360-16 (AISC 341-16 as applicable); DSA IR 17-3.
<input checked="" type="checkbox"/>	b. Inspect single-pass fillet welds ≤ 5/16".	Periodic	SI	Table 1705A.2.1 Item 5a.5; AISC 360-16 (AISC 341-16 as applicable); DSA IR 17-3.
<input type="checkbox"/>	c. Inspect end-welded studs (ASTM A-108) installation (including bend test).	Periodic	SI	2213A.2; AISC 360-16 (AISC 341-16 as applicable); AWS D1.1; DSA IR 17-3.
<input type="checkbox"/>	d. Inspect floor and roof deck welds.	Periodic	SI	1705A.2.2, Table 1705A.2.1 Item 5a.6; AISC 360-16 (AISC 341-16 as applicable); AWS D1.3; DSA IR 17-3.
<input type="checkbox"/>	e. Inspect welding of structural cold-formed steel.	Periodic	SI*	1705A.2.5; AWS D1.3; DSA IR 17-3. The quality control provisions of AISI S240-20 Chapter D shall also apply. * May be performed by the project inspector when specifically approved by DSA.
<input type="checkbox"/>	f. Inspect welding of stairs and railing systems.	Periodic	SI*	1705A.2.1; AISC 360-16 (AISC 341-16 as applicable); AWS D1.1 & D1.3; DSA IR 17-3. * May be performed by the project inspector when specifically approved by DSA.
<input type="checkbox"/>	g. Verification of reinforcing steel weldability.	Periodic	SI	1705A.3.1; AWS D1.4; DSA IR 17-3. Verify carbon equivalent reported on mill certificates.
<input type="checkbox"/>	h. Inspect welding of reinforcing steel.	Continuous	SI	Table 1705A.2.1 Item 5b, 1705A.3.1, Table 1705A.3 Item 2, 1903A.8; AWS D1.4; DSA IR 17-3.

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1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

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Test or Special Inspection	Type	Performed By	Code References and Notes
S/A6. NONDESTRUCTIVE TESTING:			
Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/> a. Ultrasonic	Test	LOR	1705A.2.1, 1705A.2.5; AISC 341-16 J6.2, AISC 360-16 N5.5; AWS D1.1, AWS D1.8; DSA IR 17-2.
<input type="checkbox"/> b. Magnetic Particle	Test	LOR	1705A.2.1, 1705A.2.5; AISC 341-16 J6.2, AISC 360-16 N5.5; AWS D1.1, AWS D1.8; DSA IR 17-2.
<input type="checkbox"/> c.	Test	LOR	

S/A7. STEEL JOISTS AND TRUSSES:			
Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/> a. Verify size, type and grade for all chord and web members as well as connectors and weld filler material; verify joist profile, dimensions and camber (if applicable); verify all weld locations, lengths and profiles; mark or tag each joist.	Continuous	SI	1705A.2.3, Table 1705A.2.3; AWS D1.1; DSA IR 22-3 for steel joists only. 1705A.2.4; AWS D1.3 for cold-formed steel trusses.

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1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; RCSC 2014; AISI S100-20; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

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Test or Special Inspection	Type	Performed By	Code References and Notes
S/A8. SPRAYED FIRE-RESISTANT MATERIALS:			
Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/> a. Examine structural steel surface conditions, inspect application, take samples, measure thickness and verify compliance of all aspects of application with DSA-approved documents.	Periodic	SI	1705A.15, 1705A.1, 1705A.2, 1705A.3, 1705A.4.
<input type="checkbox"/> b. Test density.	Test	LOR	1705A.15.1, 1705A.15.5, ASTM E736
<input type="checkbox"/> c. Bond strength adhesion/cohesion.	Test	LOR	1705A.15.1, 1705A.15.4, ASTM E605

S/A9. ANCHOR BOLTS AND ANCHOR RODS:			
Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/> a. Anchor Bolts and Anchor Rods	Test	LOR	Sample and test anchor bolts and anchor rods not readily identifiable per procedures noted in DSA IR 17-11.
<input type="checkbox"/> b. Threaded rod not used for foundation anchorage.	Test	LOR	Sample and test threaded rods not readily identifiable per procedures noted in DSA IR 17-11.

S/A10. STORAGE RACK SYSTEMS:			
Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/> a. Materials used, to verify compliance with one or more of the material test reports in accordance with the approved construction documents.	Periodic	SI	Table 1705A.13.7
<input type="checkbox"/> b. Fabricated storage rack elements.	Periodic	SI	1704A.2.5; Table 1705A.13.7

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1705A.2.1, Table 1705A.2.1; AISC 303-16, AISC 341-16, AISC 358-16, AISC 360-16; RCSC 2014; AWS D1.1, AWS D1.2, AWS D1.3, AWS D1.4, AWS D1.8

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	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	c. Storage rack anchorage installation.	Periodic	SI	ANSI/MH16.1 Section 7.3.2; Table 1705A.13.7
<input type="checkbox"/>	d. Completed storage rack system to indicate compliance with the approved construction documents.	Periodic	SI*	Table 1705A.13.7; * May be performed by the project inspector when specifically approved by DSA.

S/A11. Other Steel				
	Test or Special Inspection	Type	Performed By	Code References and Notes
<input type="checkbox"/>	a.			

Appendix: Work Exempt from DSA Requirements for Structural Tests / Special Inspections

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Exempt items given in DSA IR A-22 or the 2019 CBC (including DSA amendments) and those items identified below with a check mark by the design professional are NOT subject to DSA requirements for the structural tests / special inspections noted. **Items marked as exempt shall be identified on the approved construction documents.** The project inspector shall verify all construction complies with the approved construction documents.

	SOILS:
<input type="checkbox"/>	1. Deep foundations acting as a cantilever footing with a design based on minimum allowable pressures per CBC Table 1806A.2 and without a geotechnical report for the following cases: A) free standing sign or scoreboard, B) cell or antenna towers and poles less than 35'-0" tall (e.g., lighting poles, flag poles, poles supporting open mesh fences, etc.), C) single-story structure with dead load less than 5 psf (e.g., open fabric shade structure), or D) covered walkway structure with an apex height less than 10'-0" above adjacent grade.
<input type="checkbox"/>	2. Shallow foundations, etc. are exempt from special inspections and testing by a Geotechnical Engineer for the following cases: A) buildings without a geotechnical report and meeting the exception item #1 criteria in CBC Section 1803A.2 supported by native soil (any excavation depth) or fill soil (not exceeding 12" depth per CBC Section 1804A.6), B) soil scarification/recompaction not exceeding 12" depth, C) native or fill soil supporting exterior non-structural flatwork (e.g., sidewalks, site concrete ramps, site stairs, parking lots, driveways, etc.), D) unpaved landscaping and playground areas, or E) utility trench backfill.

	CONCRETE/MASONRY:
<input type="checkbox"/>	1. Post-installed anchors for the following: A) exempt non-structural components (e.g., mechanical, electrical, plumbing equipment - see item 7 for "Welding" in the Appendix below) given in CBC Section 1617A.1.18 (which replaces ASCE 7-16, Section 13.1.4) or B) interior nonstructural wall partitions meeting criteria listed in exempt item 3 for "Welding" in the Appendix below
<input type="checkbox"/>	2. Concrete batch plant inspection is not required for items given in CBC Section 1705A.3.2 subject to the requirements and limitations in that section.
<input type="checkbox"/>	3. Non-bearing non-shear masonry walls may be exempt from certain DSA masonry testing and special inspection items as allowed per DSA IR 21-1. Refer to construction documents for specific exemptions accordingly for each applicable wall condition.
<input type="checkbox"/>	4. Epoxy shear dowels in site flatwork and/or other non-structural concrete.

Appendix: Work Exempt from DSA Requirements for Structural Tests / Special Inspections


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CONCRETE/MASONRY:	
<input type="checkbox"/>	5. Testing of reinforcing bars is not required for items given in CBC Section 1910A.2 subject to the requirements and limitations in that section.

WELDING:	
<input type="checkbox"/>	1. Solid-clad and open-mesh fences, gates with maximum leaf span of 10', and gates with a maximum rolling section of 10' all having an apex height less than 8'-0" above lowest adjacent grade. When located above circulation or occupied space below, these gates/fences are not located within 1.5x gate/fence height (max 8'-0") to the edge of floor or roof.
<input type="checkbox"/>	2. Handrails, guardrails, and modular or relocatable ramps associated with walking surfaces less than 30" above adjacent grade (excluding post base connections per the 'Exception' language in Section 1705A.2.1); fillet welds shall not be ground flush.
<input type="checkbox"/>	3. Non-structural interior cold-formed steel framing spanning less than 15'-0", such as in interior partitions, interior soffits, etc. supporting only self weight and light-weight finishes or adhered tile, masonry, stone, or terra cotta veneer no more than 5/8" thickness and apex less than 20'-0" in height and not over an exit way. Maximum tributary load to a member shall not exceed the equivalent of that occurring from a 10'x10' opening in a 15' tall wall for a header or king stud.
<input type="checkbox"/>	4. Manufactured support frames and curbs using hot rolled or cold-formed steel (i.e., light gauge) for mechanical, electrical, or plumbing equipment weighing less than 2000# (equipment only) (connections of such frames to superstructure elements using welding will require special inspection as noted in selected item(s) for Sections S/A3, S/A4 and/or S/A5 of listing above).
<input type="checkbox"/>	5. Manufactured components (e.g., Tolco, B-Line, Afcon, etc.) for mechanical, electrical, or plumbing hanger support and bracing (connections of such components to superstructure elements using welding will require special inspection as noted in selected item(s) for Sections S/A3, S/A4 and/or S/A5 of listing above).
<input type="checkbox"/>	6. TV Brackets, projector mounts with a valid listing (see DSA IR A-5) and recreational equipment (e.g., playground structures, basketball backstops, etc.) (connections of such elements to superstructure elements using welding will require special inspection as noted in selected item(s) for sections S/A3, S/A4 and/or S/A5 located in the Steel/Aluminum category of listing above).
<input type="checkbox"/>	7. Any support for exempt non-structural components given in CBC Section 1617A.1.18 (which replaces ASCE 7-16, Section 13.1.4) meeting the following: A) when supported on a floor/roof, <400# and resulting composite center of mass (including component's center of mass) ≤4' above supporting floor/roof, B) when hung from a wall or roof/floor, <20# for discrete units or <5 plf for distributed systems.

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Name of Architect or Engineer in general responsible charge: <p style="text-align: center; font-weight: bold;">Yong Yoo, C-31162 (PBK Architects)</p>
Name of Structural Engineer (When structural design has been delegated): <p style="text-align: center; font-weight: bold;">Josh Randall, SE# 4506 (KNA Structural Engineers, Inc.)</p>
Signature of Architect or Structural Engineer: 
Date: 9/22/2023

Note: To facilitate DSA electronic mark-ups and identification stamp application, DSA recommends against using secured electronic or digital signatures.

DSA STAMP

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT

APP: 03-123048 INC:

REVIEWED FOR

SS FLS THE STATE ARCHITECTS

DATE: 10/05/2023

DSA 103-22: LIST OF REQUIRED VERIFIED REPORTS, CBC 2022

Application Number:
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1. Structural Testing and Inspection: Laboratory Verified Report Form DSA 291

2. Post-installed Anchors: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292

3. Shop Welding Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292

4. Field Welding Inspection: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292