

Physician Lounge & UMC Board Room

Technical Specifications



Phase I: Executive & Administration Offices & Physician Lounge

100% CONSTRUCTION DOCUMENTS



Prepared by Exigo Architecture

May 31, 2024

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END OF DOCUMENT

SECTION 00 10 00

INSTRUCTIONS TO BIDDERS

1. Project Name: Physician Lounge & UMC Board Room
2. This document contains instructions to bidders for the project named above. This bidding document is not part of the Contract Documents, unless specifically referenced in the Owner/Contractor Agreement.
3. To obtain bidding documents contact:

Liliana Guerrero | Materials Resource Manager
Office: 915.521.7353
liliana.guerrero@umcelpaso.org
4. Documents: Documents will be emailed to all bidders in form of PDF for bidders to print as needed on **June 9, 2024**. There is no deposit required.
5. Submission of Bids: Submit bids in sealed and labeled envelopes with the project name and bidder's name on the outside of the envelope. Bidders shall completely fill out the Bid Form provided in the Specifications Manual.

Mark the envelope: "Bid Enclosed - Do Not Open".

Submit Sealed Bids To: **UMC**

Date and Time: **July 20, 2024, by 2:00 PM.**

6. A Bid Bond will NOT be required.
7. Successful bidder will be required to furnish 100% Payment and Performance Bond of the cost of the entire Work and shall be executed by a surety company licensed to do business at the locations of the project. Bond form shall be AIA Document A312 or similar.
8. Oral, written, or telecopied modifications to bids will not be considered. Modifying or qualifying statements of any kind shall be on a separate sheet and submitted in the same envelope with the bid.
9. The Owner reserves the right to reject or accept any or all bids or to enter into negotiations with any bidder. The Owner reserves the right to waive any alleged breach of technicality.
10. The Owner reserves the right to modify the Contract Documents and re-bid the project, if necessary, to meet Owner's budgetary requirements.
11. Questions: During the bidding period, submit technical questions in writing no later than July 10, 2024 to:

Liliana Guerrero | Materials Resource Manager
Office: 915.521.7353
liliana.guerrero@umcelpaso.org

All Questions and Comments will distributed to all bidders via e-mail..

**Physicians Lounge & UMC Board Room
El Paso, Texas**

12. Pre-Bid Conference: Attendance to the Pre-Bid Conference is not mandatory, otherwise bids from absentees will be considered.
13. Date and Time of Pre-Bid Conference:

June 26, 2024 at 2PM location T.B.D.

END OF SECTION

SECTION 00 30 00

BID FORM

UMC Physician Lounge & UMC Board Room

- a. 4800 Alberta St El Paso TX 79905 (Admin Offices)
- b. 4815 Alameda Ave El Paso TX 79905 (Physicians Lounge) Basement

Ladies / Gentleman:

This proposal is submitted by:

Whose address is:

To Materials Resource Manager:

Liliana Guerrero | Materials Resource Manager

Office: 915.521.7353

liliana.guerrero@umcelpaso.org

(Hereafter called "Bidder"), for General Construction of **the Phase I - Physicians Lounge & UMC Board Room**

BASE BID 1 (Physicians Lounge):

Base Bid includes the following:

1. All Work described in the Contract Documents.
2. Applicable, building permits, GL Insurance, Builders Risk Insurance and Worker Compensation Insurance.
3. All Federal, State, and Local Taxes that apply for this project.

SUB TOTAL BASE BID PRICE:

_____(Dollars)

(\$ _____).

BASE BID 2 (Executive & Administrative Offices):

Base Bid includes the following:

1. All Work described in the Contract Documents.
2. Applicable, building permits, GL Insurance, Builders Risk Insurance and Worker Compensation Insurance.
3. All Federal, State, and Local Taxes that apply for this project.

SUB TOTAL BASE BID PRICE:

_____(Dollars)

(\$ _____).

Include 10% of Contractors Base Bid of project contingency.

_____(Dollars)

TOTAL BASE BID PRICE & CONTINGENCY:

_____(Dollars)

(\$ _____).

Include the following Alternates:

A. Alternate No. 1 on Base Bid 2 (Executive & Administrative Offices),

Replace the lower portion of existing single pane tinted glass at Offices Room No. 154,154,157,158 with insulated double pane glazing in the existing aluminum storefront.

Section 10 22 00 Folding Partitions

Additive _____(Dollars)

(\$ _____).

B. Alternate No. 2 on Base Bid 2 (Executive & Administrative Offices),

Replace existing flooring at Area & B Corridor as depicted in Hatched Region on contract drawings, with new flooring (FF-1A). Refer to Interior Finish Schedule for information.

Additive _____(Dollars)

(\$ _____).

The Bidder agrees to the following for the Base Bid;

- A.** Contractor to perform the work in **210** consecutive calendar days to accomplish Substantial Completion. There will be a liquidated damages charge, not a penalty, of \$ 500.00 per day that the project is not substantially completed beyond this limit.

Agree with proposed construction schedule & deadline:

By: _____ Date _____
(Signature)

If the contractor does not agree with the proposed construction schedule, provide alternate completion days.

By: _____ Date _____.
(Signature)

Proposed consecutive calendar days to Substantial Completion: _____ days.

SCHEDULE OF VALUES:

Upon award, Contractor is to provide a schedule of values table outlining separately General Conditions and Overhead and Profit.

It is agreed that this proposal is subjected to the Owner's acceptance for a period of 60 (sixty days) from the above date.

The bidder acknowledges receipt of the following addendum; _____ through _____ inclusive.

Bidder agrees that the Owner has the right to accept or reject any or all bids and to waive all formalities.

Respectfully Submitted,

By: _____ Date _____.
(Signature)

(Title)

(Company Seal if bidder is a corporation)

DOCUMENT 00 52 00
AGREEMENT FORMS

1.01 FORM OF AGREEMENT FOR THE CONTRACT FOR CONSTRUCTION

A Contract for Construction will be executed by the Owner and the Contractor identified in the Agreement. Unless otherwise indicated, the form of agreement for the Contract will be a Fixed-Price Construction Agreement between Owner and Contractor.

1.02 CONTRACT CONDITIONS

Refer to Division 00 Document "Contract Conditions" for contract terms and conditions not contained in the executed form of Agreement.

END OF DOCUMENT

DOCUMENT 00 72 00
CONTRACT FOR CONSTRUCTION

1.01 CONTRACT FOR CONSTRUCTION

A Contract for Construction has been executed by the Owner and the Contractor. Conditions of the Contract are based on a Fixed Price Construction Agreement between Owner and Contractor. These contract conditions and supplementary conditions are available from the Owner.

END OF DOCUMENT

SECTION 01 10 00
SUMMARY

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Phased construction.
 - 4. Work under separate contracts.
 - 5. Access to site.
 - 6. Coordination with occupants.
 - 7. Work restrictions.
 - 8. Specification and Drawing conventions.
- B. Related Sections include Division Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.02 PROJECT INFORMATION

- A. Project Identification: Physician Lounge & UMC Board Room
 - 1. Project Locations:
 - a. 4800 Alberta St El Paso TX 79905 (Admin Offices)
 - b. 4815 Alameda Ave El Paso Tx 79905 (Physicians Lounge) Basement
- B. Owner: University Medical Center

Liliana Guerrero | Materials Resource Manager
Office: 915.521.7353
liliana.querrero@umcel Paso.org
- C. Architect: Exigo Architecture.
 - 1. Address: 211 North Florence, Suite 204, El Paso, Texas 79901.
 - a. Contact: Eugenio Mesta, AIA.
 - 1) Phone: (915) 533-0323
 - 2) Email: emesta@exigoarch.com
- D. Web-Based Project Software: Project software administered by Owner will be used for purposes of managing communication and documents during the construction stage.

1.03 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Package I Contract Documents and consists of a the renovation of Executive Offices and Physicians Lounge.
- B. Type of Contract: Project will be constructed under a Fixed Price Construction Agreement between Owner and Contractor

1.04 PHASED CONSTRUCTION

- 1. Not Applicable

1.05 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

1.06 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.07 COORDINATION WITH OCCUPANTS

- A. 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 such 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, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On

occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.

4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.08 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 1. 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 business working hours of permitted by authorities having jurisdiction, unless otherwise indicated.
- C. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.09 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 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
 1. This set of Division 01 "General Requirements" has been developed to apply to all phases of the Project and contains requirements which are applicable to the entire project. Certain specific requirements may only apply to the Work of one or two phases.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 13 00

ALTERNATES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Base Bid submission procedures.

1.2 RELATED SECTIONS

- A. Instructions To Bidders

1.3 SUBMISSION REQUIREMENTS

- A. Submit Base Bids identifying the effect on adjacent or related components.
- B. Base Bids quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted Base Bids will be identified in the Owner-Contractor Agreement.
- C. Coordinate related work and modify surrounding work to integrate the Work of each alternate.

1.4 SCHEDULE OF ALTERNATES

- A. **Alternate No. 1 on Base Bid 2 (Executive & Administrative Offices),**

Replace the lower portion of existing single pane tinted glass at Offices Room No. 154,154,157,158 with insulated double pane glazing in the existing aluminum storefront.

- B. **Alternate No. 2 on Base Bid 2 (Executive & Administrative Offices),**

Replace existing flooring at Area A & B Corridor as depicted in Hatched Region on contract drawings, with new flooring (FF-1A). Refer to Interior Finish Schedule for information.

END OF SECTION

ALTERNATES

01 1300-1

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Sections include:
 - 1. Division 01 Section "Allowances" for products selected under an allowance, if any.
 - 2. Division 01 Section "Alternates" for products selected under an alternate.
 - 3. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.02 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.03 SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use form distributed by Architect.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties,

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

1.04 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:
 - 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.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed.
 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:
 - 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.

END OF SECTION

SUBSTITUTION REQUEST FORM

Refer to Division 01 Section "Substitution Procedures" for procedures governing product substitutions. Request to substitute products will only be accepted from the Contractor and cannot be accepted without a completed Substitution Request Form.

To: **EXIGO**
211 N. Florence, Suite 204
El Paso, Texas 79901

Phone: 915-533-0323

Substitution Request Number: _____

Date: _____

Project: _____

From: _____

Project No.: _____

Contract For: _____

Specification Section Number: _____ Title: _____

Page: _____ Article/Paragraph: _____ Description: _____

Proposed Substitution: _____

Trade Name: _____ Model No.: _____

Manufacturer: _____ Address: _____ Phone: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 2-5 years old ☐ 5 – 10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

☐ Point-by-point comparative data attached – REQUIRED BY A/E

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

Date Installed: _____

Proposed substitution affects other parts of Work: No Yes, explain: _____

Savings to Owner for accepting substitution: _____ (\$ _____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

SUBSTITUTION REQUEST FORM

(Continued)

The Undersigned hereby certifies that:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments: _____

A/E's REVIEW AND ACTION

- ☐ Recommended for approval by Owner
- ☐ Recommended as noted for approval by Owner
- ☐ Not recommended; forwarded to Owner for Action
- ☐ Substitution rejected – Use specified materials.
- ☐ Substitution Request received too late – Use specified materials.

Signed by: _____ Date: _____

OWNER's REVIEW AND ACTION

- ☐ Substitution approved – Prepare Change Order Request
(follow Division 1 Section "Contract Modification Procedures")
- ☐ Substitution rejected – Use specified materials.

Signed by: _____ Date: _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ _____

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include Division 01 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.02 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 "Architect's Supplemental Instructions" form.

1.03 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. 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 or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect.
- 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 a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.04 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.05 CHANGE ORDER PROCEDURES

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

1.06 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on Architect's "Construction Change Directive" form. 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. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include:
 - 1. Division 01 Section "Allowances" for procedural requirements governing the handling and processing of allowances.
 - 2. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 3. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.02 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.03 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document 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, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site.
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. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.
8. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
9. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.04 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

PAYMENT PROCEDURES

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Phase I: 100% Construction Documents

1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.

PAYMENT PROCEDURES

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Phase I: 100% Construction Documents

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Products list (preliminary if not final).
 5. Submittal schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Report of preconstruction conference.
 12. Certificates of insurance and insurance policies.
 13. Performance and payment bonds.
 14. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706-1994, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A-1994, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707-1994, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PAYMENT PROCEDURES

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SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination drawings.
 - 2. Requests for Information (RFIs).
 - 3. Digital project management procedures.
 - 4. Project meetings including:
 - a. Preconstruction conference.
 - b. Preinstallation conferences.
 - c. Progress meetings.
 - d. Coordination meetings.
 - e. Project closeout conference.
- B. Related Sections include:
 - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control Division.
 - 3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.02 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information from each other during construction.

1.03 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

Key Personnel Names: 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 their duties and responsibilities; list addresses and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

4. Post copies of list in project meeting room, in temporary field office, and in prominent location in built facility. Keep list current at all times.

1.04 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
 9. Project closeout activities.

1.05 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
 1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
 3. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Division 01 Section "Submittal Procedures."
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
 1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 2. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
 3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Contractor shall execute a data licensing agreement in the form of AIA Document C106.

1.06 REQUESTS FOR INFORMATION (RFIS)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716 or software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
- G. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.07 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.
1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 3. Contractor shall execute a data licensing agreement in the form of AIA Document C106 Digital Data Licensing Agreement or other agreement form acceptable to Owner and Architect.
 - a. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of AIA Document C106 or other agreement acceptable to Owner and Architect.
 4. The following digital data files will be furnished for each appropriate discipline:

- a. Floor plans.
 - b. Reflected ceiling plans.
- B. Web-Based Project Software: Use Owner's web-based Project software site for purposes of hosting and managing Project communication and documentation until Final Completion.
 - 1. Web-based Project software site includes, at a minimum, the following features:
 - a. Compilation of Project data, including Contractor, subcontractors, Architect, architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
 - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
 - c. Document workflow planning, allowing customization of workflow between project entities.
 - d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
 - e. Track status of each Project communication in real time, and log time and date when responses are provided.
 - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
 - g. Processing and tracking of payment applications.
 - h. Processing and tracking of contract modifications.
 - i. Creating and distributing meeting minutes.
 - j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
 - k. Mobile device compatibility, including smartphones and tablets.
 - 2. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
- C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
 - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.08 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
 - a. Minutes to be revised, if necessary, to accurately convey the understanding of all parties.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Critical work sequencing and long-lead items.
 - c. Designation of key personnel and their duties.
 - d. Geotechnical Report review.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of record documents.
 - l. Use of the premises and existing building.
 - m. Work restrictions.
 - n. Working hours.
 - o. Owner's occupancy requirements.
 - p. Responsibility for temporary facilities and controls.
 - q. Procedures for moisture and mold control.
 - r. Procedures for disruptions and shutdowns.
 - s. Parking availability.
 - t. Office, work, and storage areas.
 - u. Equipment deliveries and priorities.
 - v. First aid.
 - w. Security.
 - x. Progress cleaning.
 - y. Permit requirements, status, and issues.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at regular intervals.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at

these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 60 days prior to the scheduled date of Substantial Completion.
 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other con-

cerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing operations and maintenance data.
 - e. Requirements for delivery of material samples, attic stock, and spare parts.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Coordination of separate contracts.
 - k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 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. Unusual event reports.

1.02 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the Project.
- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Event: The starting or ending point of an activity.
- E. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

- F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.03 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in PDF electronic file format.
 - 1. Working electronic copy of schedule file, where indicated in .XER format.
 - 2. PDF file.
- B. Startup construction schedule.
- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.
 - 4. Earnings Report: Compilation of Contractor's total earnings from 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. Unusual Event Reports: Submit at time of unusual event.

1.04 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including work stages, area separations, interim milestones, and partial Owner occupancy.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review schedule for work of Owner's separate contracts.
 - 6. Review submittal requirements and procedures.

7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.05 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from entities involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.06 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 1. Use Oracle Primavera P6, for current Windows operating system.
- B. Create a schedule using a work breakdown structure (WBS) outline.
- C. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- D. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and Contract Time.
- E. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

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Phase I: 100% Construction Documents

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.
- F. 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, equipment required to achieve compliance, and date by which recovery will be accomplished.
- G. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.07 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to correlate with Contract Time.
 5. Create and maintain one version of the schedule as a master copy, then make incremental copies for each subsequent submittal to the Owner. There is only "the schedule".
 6. Do not use constraints as they will override logic. Constraints are exceptions and MUST be approved by the "Owner" before acceptance in the baseline schedule.
 7. Use "physical percent complete" as the default setting to update the schedule. Use of "duration percent complete" settings are not acceptable and will be rejected.
 8. Use "Intelligent Task ID's" for the task / activity items. These ID's help the reviewer to understand what part of the building, floor, area, system, etc. the work is associated with without having to use a data dictionary.

9. Include all long lead procurement items as individual tasks to clearly identify the associated submittals needed and the timing to support the project.
 10. Define the procurement activities (submittals, approvals, fabrication, and delivery separations) in enough detail to identify the responsible party (Contractor, AE, Owner, Subcontractors, etc.).
 11. Do not use multi-trade, or multi-task activity descriptions (i.e., “MEP”, “submit & approve”, etc.).
 12. Ensure that activity durations are less than two weeks and broken down by phases, floors, wings, areas, etc. that make reasonable sense for the sequencing of the project.
 13. Ensure that less than ten percent of the activities have a “critical” (i.e., zero) value for total float.
 14. Use calendar days for all activities. Holidays shall be outlined and clearly defined. Verify the Owner’s holiday schedules.
 15. The Owner requires a minimum amount of float to be included in the baseline schedule.
- B. Address weather delays and standards.
- C. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- D. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight “early start-total float.” Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the schedule of values).
- E. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.

1.08 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Construction Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.

- B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project 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 Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. 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. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

1.09 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Submittal schedule requirements.
 - 2. Administrative and procedural requirements for submittals.
- B. Related Sections include:
 - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
 - 3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 4. Division 01 Section "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
 - 5. Division 01 Section "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
 - 6. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 7. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 8. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.02 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.03 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include

additional time required for making corrections or 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 startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.

1.04 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
 1. Project name.
 2. Date.
 3. Name of Architect.
 4. Name of Contractor.
 5. Name of firm or entity that prepared submittal.
 6. Names of subcontractor, manufacturer, and supplier.
 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
 8. Category and type of submittal.
 9. Submittal purpose and description.
 10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 11. Drawing number and detail references, as appropriate.
 12. Indication of full or partial submittal.
 13. Location(s) where product is to be installed, as appropriate.
 14. Other necessary identification.
 15. Remarks.
 16. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.

- C. Paper Submittals: Provide full-size hard copies for review upon request.
1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
 4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
 5. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 6. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using transmittal form approved by Architect.
- D. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
1. Prepare PDF to be printed as full-size drawings.
 2. Provide navigation features indicated below. Submittals without navigation features will be rejected without review.
 - a. Include digital bookmarks for each sheet appearing in the bookmarks tab of a PDF viewer, for submittals five sheets/pages or more in length. Match bookmark names to number and name of sheet.
 - b. Live-link detail callouts to indicated detail or sheet to facilitate navigation between drawings within a document.
 - c. Provide a table of contents for submittals with a combination of product information and drawings.

1.05 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Email: Prepare submittals as PDF package, and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
 - a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
 2. Paper: Prepare submittals in paper form, and deliver to Architect.
- 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 all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections 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, as follows.
1. Time for review shall commence on Architect's receipt of submittal except as noted below. 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.
 - a. Submittals or Requests for Information transmitted to Architect after noon local time shall count as transmitted the following business day.
 2. Processing and Priorities: Allow sufficient time for submittal review, including time for resubmittals to avoid delays in installation.
 - a. For more than three submissions within three days, from one or multiple trades, indicate priority for processing and return of transmittal.
 - 1) Indicate correct submittal dates on schedule.
 - 2) Request approval in writing by Architect for return of priority submissions according to review schedules below.
 3. Initial Review:
 - a. General Submittals: 10 business days.
 - b. Mechanical and Electrical Submittals: 15 business days.
 - c. Large Submittals with 50 Sheets/Pages or More: 15 business days.
 - d. Coordination Drawings: 20 business days.
 - e. Requests for Information: 10 business days.
 - f. Additional Review: Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 4. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 5. Resubmittal Review: If resubmittal review is necessary, process it in same manner as initial submittal.
 6. 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.
 7. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's

consultants, process it in same manner as initial submittal. Submittal will be returned to Architect before being returned to Contractor.

- a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
- D. 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.
- E. 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.
- F. 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.

1.06 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.

- B. 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 unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
 - a. Two opaque copies of each submittal. Architect will return one copy.
- C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
 4. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
 5. 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.

6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit four sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
 - 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.
- D. 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.
- E. 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.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
 1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be

signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.

2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.07 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF 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.

1.08 CONTRACTOR'S REVIEW

- A. Action Submittals 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. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - 1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.09 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.
 - 1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.
 - 2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect will return without review submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 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. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include Divisions 02 through 49 Sections for specific test and inspection requirements.

1.02 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full size physical assemblies that are constructed on-site. 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.
- D. Preconstruction 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.

- E. 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.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.
- J. Experienced: When used with an entity or individual, “experienced” means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.03 CONFLICTING REQUIREMENTS

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

1.04 INFORMATIONAL SUBMITTALS

- A. Testing Agency Qualifications: For testing agencies specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.05 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.

3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 5. Other required items indicated in individual Specification Sections.
- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.06 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those

performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

- F. Specialists: 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.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Mockups: 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:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.07 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. 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.
 - 2. Costs for retesting and reinspecting 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.

QUALITY REQUIREMENTS

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- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- F. Associated 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. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.08 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Except as otherwise indicated, Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. 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.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."
- B. Protect construction exposed by or for quality-control service activities.

- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

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REFERENCES

PART 1 - GENERAL

1.01 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.02 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.03 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
 - 1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
 - 2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
 - 3. ICC - International Code Council; www.iccsafe.org.
 - 4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.
- C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.
 - 1. COE - Army Corps of Engineers; www.usace.army.mil.
 - 2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
 - 3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
 - 4. DOD - Department of Defense; www.quicksearch.dla.mil.
 - 5. DOE - Department of Energy; www.energy.gov.
 - 6. EPA - Environmental Protection Agency; www.epa.gov.
 - 7. FG - Federal Government Publications; www.gpo.gov/fdsys.
 - 8. GSA - General Services Administration; www.gsa.gov.
 - 9. HUD - Department of Housing and Urban Development; www.hud.gov.
 - 10. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
 - 11. OSHA - Occupational Safety & Health Administration; www.osha.gov.
 - 12. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
 - 13. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.

REFERENCES

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- D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
 2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
 3. DSCC - Defense Supply Center Columbus; (See FS).
 4. FED-STD - Federal Standard; (See FS).
 5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
 6. MILSPEC - Military Specification and Standards; (See DOD).
- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
 2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
 3. CDHS; California Department of Health Services; (See CDPH).
 4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
 5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
 6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
 7. TAS, Texas Accessibility Standards; <http://www.tdlr.texas.gov/ab/abtas.htm>.
 8. TDI, Texas Department of Insurance; <http://www.tdi.texas.gov/>.
 9. TDLR, Texas Department of Licensing and Regulation; **Error! Hyperlink reference not valid..**
 10. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservation.tamu.edu.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

REFERENCES

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SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.

1.02 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Water Service: Pay water-service use charges for water used by all entities for construction operations.
- C. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.03 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

1.04 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the TDLR "2012 Texas Accessibility Standards" (TAS).

1.05 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.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top rails.

2.02 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 12 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. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 - 5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.03 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

TEMPORARY FACILITIES AND CONTROLS

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Phase I: 100% Construction Documents

- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction. and clean HVAC system as required in Section 017700 "Closeout Procedures."

PART 3 - EXECUTION

3.01 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

3.02 INSTALLATION, GENERAL

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

3.03 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

- D. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- E. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
- F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- G. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one land-based telephone line(s) for each field office.
 - 1. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
- H. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Owner, Architect, and other consultants as requested.

3.04 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

TEMPORARY FACILITIES AND CONTROLS

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1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary parking areas for construction personnel.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.
- F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touch up 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 Division 01 Section "Execution."
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.05 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

TEMPORARY FACILITIES AND CONTROLS

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- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Division 01 Section "Summary."
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
 - 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
 - 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 - 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 - 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.
- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

TEMPORARY FACILITIES AND CONTROLS

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- J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 4. 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.

3.06 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo 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.
 3. Indicate methods to be used to avoid trapping water in finished work.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard and replace stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

TEMPORARY FACILITIES AND CONTROLS

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- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.07 OPERATION, TERMINATION, AND REMOVAL

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

TEMPORARY FACILITIES AND CONTROLS

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3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Sections include:
 - 1. Division 01 Section "Allowances" for products selected under an allowance.
 - 2. Division 01 Section "Alternates" for products selected under an alternate.
 - 3. Division 01 Section "Substitution Procedures" for requests for substitutions.

1.02 DEFINITIONS

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

1.03 ACTION SUBMITTALS

- A. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

- B. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one 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 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

1.04 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
 2. Store materials in a manner that will not endanger Project structure.
 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 4. Store 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.

PRODUCT REQUIREMENTS

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1.06 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 - 3. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Architect will make selection.
 - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
 - 1. 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 require-

ments. Comparable products or substitutions for Contractor's convenience will not be considered.

3. Products:

- a. Restricted List: 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 be considered, unless otherwise indicated.
- b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:

- a. Restricted List: 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 be considered, unless otherwise indicated.
- b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

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 other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

- 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.02 COMPARABLE PRODUCTS

- A. Conditions for Consideration: 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:

PRODUCT REQUIREMENTS

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1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 73 00
EXECUTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
 - 9. Correction of the Work.
- B. Related Requirements:
 - 1. Division 01 Section "Summary" for limits on use of Project site.
 - 2. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.02 INFORMATIONAL SUBMITTALS

- A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- B. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.03 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do

- not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Comply with requirements specified in other Sections.
 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements of Division 01 Section "Sustainable Design Requirements."
- 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

3.01 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

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- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Re-check measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.03 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.

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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.

3.04 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project 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.
- C. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 1. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.05 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

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- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.06 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

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- E. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

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3.07 OWNER-INSTALLED PRODUCTS

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

3.08 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
- 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.

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- 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.

3.09 STARTING AND ADJUSTING

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

3.10 PROTECTION OF INSTALLED CONSTRUCTION

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

END OF SECTION

EXECUTION

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Phase I: 100% Construction Documents

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Sections include:
 - 1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 2. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 3. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.

1.02 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.03 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.04 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.05 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: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. 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.
 - a. Schedule of Maintenance Material Items: 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.
 - 5. Submit test/adjust/balance records.
 - 6. Submit sustainable design submittals required in Division 01 Section "Sustainable Design Requirements.
 - 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
 - 6. Advise Owner of changeover in heat and other utilities.
 - 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 9. Complete final cleaning requirements, including touchup painting.

CLOSEOUT PROCEDURES

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10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 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.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.06 FINAL COMPLETION PROCEDURES

- A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training prerecorded videos.
- B. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
- C. Accessibility Inspection:
1. Owner will engage a Registered Accessibility Specialist to perform accessibility inspection required by TDLR.
 2. Coordinate inspection schedule with Owner's Accessibility Specialist.
 3. Correct deficiencies identified in accessibility inspection.
 4. Notify the Owner when deficiencies have been corrected.

1.07 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Submit list of incomplete items in PDF electronic file format.

1.08 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2- by- 11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.01 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. 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.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar drippings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - p. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Division 01 Section "Temporary Facilities and Controls." Prepare written report.

3.02 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SUMMARY

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

1.02 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
 2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.
- C. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
1. 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 and Commissioning Authority's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.01 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.
- B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- C. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Construction Manager.
 - 7. Name and contact information for Architect.
 - 8. Name and contact information for Commissioning Authority.
 - 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 - 10. Cross-reference to related systems in other operation and maintenance manuals.
- D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- E. 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.
- F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in 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.

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

2.02 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.03 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.04 PRODUCT MAINTENANCE MANUALS

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

2.05 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

- C. **Manufacturers' Maintenance Documentation:** Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. **Maintenance Procedures:** Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- E. **Maintenance and Service Schedules:** Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. **Spare Parts List and Source Information:** Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. **Maintenance Service Contracts:** Include copies of maintenance agreements with name and telephone number of service agent.
- H. **Warranties and Bonds:** Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.01 MANUAL PREPARATION

- 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. **Product Maintenance Manual:** Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. **Operation and Maintenance Manuals:** Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- D. **Manufacturers' Data:** Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract

OPERATION AND MAINTENANCE DATA

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Documents. Identify data applicable to the Work and delete references to information not applicable.

- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
- F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Product Data.
- B. Related Sections include:
 - 1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 2. Divisions 02 through 49 Sections for specific requirements for project record documents of the Work in those Sections.

1.02 CLOSEOUT SUBMITTALS

- A. Record Drawings: Submit two sets of marked-up record prints.
- B. Record Product Data: Submit one paper copy of each submittal.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Record data as soon as possible after obtaining it.
 - c. Record and check the markup before enclosing concealed installations.
 - 2. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.

3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.02 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders and record Drawings where applicable.
- B. Format: Submit record Product Data as paper copy.

2.03 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other 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.
- B. Format: Submit miscellaneous record submittals as paper copy.

PART 3 - EXECUTION

3.01 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record 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 purposes. 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

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training video recordings.

1.02 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules utilizing manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

1.03 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit one copies within seven days of end of each training module.
 - 1. At completion of training, submit complete training manual(s) for Owner's use.

1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

1.05 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.01 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 - 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.

- h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."

3.02 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.

2. Owner will furnish an instructor to describe Owner's operational philosophy.
 3. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
1. Schedule training with Owner with at least seven days' advance notice.
- C. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

3.03 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. Pre-Produced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION

SECTION 02 41 13

SELECTIVE SITE DEMOLITION

PART 1 – GENERAL

1.01 SUMMARY

- A. This section requires the selective removal and subsequent offsite disposal of the following:
 - 1. Concrete;
 - 2. Curbing.
 - 3. Asphalt paving

1.02 SUBMITTALS

- A. Schedule indicating proposed sequence of operations for selective demolition work to Project Engineer for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection. Should temporary utility services be required, Contractor shall make provisions for and coordinate with all utility companies for these services at no additional cost to the owner.
- B. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of possible on-site operations.
- C. Photographs of existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal or relocation operations. File with the owner or designated representative prior to start of work.

1.03 JOB CONDITIONS

- A. Condition of structures: The Owner assumes no responsibility for actual condition of items to be demolished.
- B. Conditions existing at time of inspection of bidding purposes will be maintained by the Owner insofar as practicable. However, minor variations within this project may occur by removal and salvage operations prior to start of selective demolition work.
- C. Partial Demolition and Removal: Items indicated to be removed out of salvageable value is the property of the Owner.
- D. Protections: Provide temporary barricades and other forms of protection to protect Contractor's personnel and general public from injury due to selective demolition work.
- E. Provide protective measures as required to provide free and safe passage of Contractor's personnel and general public.

- F. Protect from damage existing pipes or structures that are to remain in place and become exposed during demolition operations.
- G. Construct temporary insulated dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed.
- H. Damages: Promptly repair damages caused to pipes or structures by demolition work.
- I. Traffic: Conduct selective demolition operations and debris removal to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
- J. Do not close, block, or otherwise obstruct streets, walks, or other occupied or used facilities without written permission from authorities having jurisdiction. Obtain permits for operations requiring closure of the walks and portions of the streets from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations. Contractor to submit a Pedestrian and Traffic Control Plan for approval prior to initiation of any work.
- K. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppressing devices during flame-cutting operations.
- L. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
- M. 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, as acceptable to governing authorities
- N. Maintain fire protection services during selective demolition operations.
- O. Environmental Controls: Use water sprinkling and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.
- P. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

PART 2 – MATERIALS (NOT USED)

PART 3 – EXECUTION

3.1 PREPARATION

- A. It shall be the Contractor's responsibility to contact all utility companies for the exact location of underground utilities including utilities not shown on the plans. The Contractor shall protect existing underground structures and utilities during construction.

3.2 DEMOLITION

- A. General: Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.

- B. Existing concrete shall be broken into pieces not greater than 18 inches in any dimension by air-driven machinery or other suitable means. Existing concrete can consist of, but is not limited to sidewalks, driveways, curb and gutter, concrete lining, rip-rap, foundations, and slabs.
- C. In projects where only a portion of the existing concrete is to be removed, Contractor shall take special care to avoid damaging concrete that will remain. Contractor shall adhere to the neat lines shown on plans and/or established by the Project Engineer in cutting the existing concrete. Any concrete beyond the established neat lines which is damaged by these operations shall be replaced at the Contractor's expense.
- D. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
- E. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to the Project Engineer in written, accurate detail. Pending receipt of directive from the Project Engineer, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.

3.3 SALVAGED MATERIALS

- A. Salvaged Items: Carefully remove salvageable items, clean, store, and turn over to the Owner and obtain receipt. The Owner reserves the right to identify salvageable items - until such time demolition operations are completed. If items are deemed not salvageable, the Contractor shall properly dispose of these items in accordance with all local, state and/or federal regulations at an approved offsite location.
- B. Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets, antiques, and other articles of historic significance, remain property of the Owner. Notify the Project Engineer if such items are encountered and obtain acceptance regarding method of removal and salvage for the Owner.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove from site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose off-site.
- B. Existing concrete, which is removed, as indicated on plans, shall be hauled and disposed of at designated points approved by the City Engineer or his/her designated representative. Existing concrete, not to be salvaged, shall be disposed of by the Contractor at locations obtained by him, and the provision that the concrete be broken into pieces no greater than 18 inches in any dimensions will not apply.
- C. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.
- D. Burning of removed materials is not permitted on project site.

3.5 CLEANUP AND REPAIR

- A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site.
- B. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 2. Loose bearing and leveling plates for applications where they are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include loose steel lintels.
- C. Related Sections include Division 05 Section "Structural Steel Framing" for steel framing, supports, and other steel items attached to the structural-steel framing.

1.02 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 metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.03 ACTION SUBMITTALS

- A. Product Data: For paint products.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
 - 1. Steel framing and supports for applications where framing and supports are not specified in other Sections.

1.04 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.05 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.06 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

2.01 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design ladders.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.02 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- E. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches unless otherwise indicated.
 - 2. Material: Cold-rolled steel, ASTM A 1008/A 1008M, structural steel, Grade 33; 0.0677-inch minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.

- F. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.03 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: ASTM F3125 Grade A325 or F1852, unless indicated otherwise; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.04 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with primers specified in Division 09 painting sections.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. 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.
- D. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.05 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing. Contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.06 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces

as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

- D. Galvanize miscellaneous framing and support at exterior locations.

2.07 METAL LADDERS

A. General:

1. Comply with ANSI A14.3, except for elevator pit ladders.
2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
3. Rail and harness fall arrest system for ladders over 24 feet or in high or hazardous areas.

B. Steel Ladders:

1. Space siderails 16 inches apart unless otherwise indicated.
2. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
3. Rungs: 3/4-inch-diameter, steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Harsco Industrial IKG, a division of Harsco Corporation.
 - 2) ROSS TECHNOLOGY CORP.
 - 3) W.S. Molnar Company.
6. Galvanize ladders, including brackets.

2.08 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize exterior miscellaneous steel trim.

2.01 ELEVATOR PIT SUMP COVERS

- A. Fabricate from welded or pressure-locked steel bar grating Limit openings in gratings to no more than 1/2 inch in least dimension.

- B. Provide steel angle supports as indicated.

2.02 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
- B. Galvanize bollards.

2.03 FINISHES

- A. General:
 - 1. Finish metal fabrications after assembly.
 - 2. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.
- B. Steel and Iron Finishes:
 - 1. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - a. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 2. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - a. Shop prime with primers specified in Division 09 painting sections.
 - 3. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - a. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

- C. Field Welding: Comply with the following requirements:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for ceiling hung toilet partitions, operable partitions, and overhead doors securely to, and rigidly brace from, building structure.

3.03 INSTALLING METAL BOLLARDS

- A. Anchor bollards in concrete in formed or core-drilled holes not less than 8 inches deep and 3/4 inch larger than OD of bollard. Fill annular space around bollard solidly with nonshrink grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.
- B. Fill bollards solidly with concrete, mounding top surface to shed water.

3.04 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION

SECTION 06 10 53
MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Wood blocking and nailers.
 - 2. Plywood backing panels.

1.02 RELATED SECTIONS

- A. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes

1.03 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - a. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 4. Include Environmental Product Declaration and Green Label Certificates for Green Globes Certification.

1.05 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Preservative-treated wood.
 - 2. Fire-retardant-treated wood.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, air barriers, and waterproofing.
 - 2. Wood blocking and similar concealed members in contact with masonry or concrete.

2.03 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat items indicated on Drawings, and the following:
 - 1. Concealed blocking.
 - 2. Plywood backing panels.

2.04 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Rooftop equipment bases and support curbs.
- B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any species.
- C. Concealed Boards: 19 percent maximum moisture content of the following species and grades:
 - 1. Mixed southern pine or southern pine, No. 3 grade; SPIB.
 - 2. Western woods, Standard or No. 3 Common grade; WCLIB or WWPA.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.05 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.06 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

MISCELLANEOUS ROUGH CARPENTRY

06 10 53-3

Phase I: 100% Construction Documents

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193, or ICC-ES AC308 as appropriate for the substrate.
 1. Material for Interior Applications Unless otherwise indicated: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 2. Material for Exterior Applications: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.07 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spun-bonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- E. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than

MISCELLANEOUS ROUGH CARPENTRY

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Phase I: 100% Construction Documents

96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.

- F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- I. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 2. FM Global Property Loss Prevention Data Sheet 1-49 for wood blocking and nailers at roofing and flashing.
 - 3. ICC-ES evaluation report for fastener.
- J. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.02 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.03 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.04 PROTECTION

- A. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 16 00
SHEATHING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Wall sheathing.
 - 2. Parapet sheathing.
 - 3. Sheathing joint and penetration treatment.
- B. Related Sections Include:
 - 1. Section 01 43 39 "Mockups" for integrated mockup requirements.
 - 2. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes
 - 3. Section 07 27 26 "Fluid-Applied Membrane Air Barriers" for air-resistive barrier applied over wall sheathing.
 - 4. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preserved treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
 - 3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
 - 4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 5. Include Environmental Product Declaration and Green Label Certificates for Green Globes Certification.
- B. Shop Drawings: For air-barrier and water-resistant glass-mat gypsum sheathing assemblies.
 - 1. Show locations and extent of sheathing, accessories, and assemblies specific to Project conditions.

2. Include details for sheathing joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.03 INFORMATIONAL SUBMITTALS

- A. Product Certificates: From air-barrier and water-resistant glass-mat gypsum sheathing manufacturer, certifying compatibility of sheathing accessory materials with Project materials that connect to or that come in contact with the sheathing.
- B. Product Test Reports: For each air-barrier and water-resistant glass-mat gypsum sheathing assembly, indicating compliance with specified requirements, for tests performed by a qualified testing agency.
- C. Evaluation Reports: For the following, from ICC-ES:
 1. Wood-preservative-treated plywood.
 2. Fire-retardant-treated plywood.

1.04 QUALITY ASSURANCE

- A. Mockups: Provide wall sheathing required to construct integrated exterior mockup specified in Division 01 Section "Mockups."

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.02 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201/D 3201M at 92 percent relative humidity. Use where exterior type is not indicated.
 4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat plywood indicated on Drawings.

2.03 PARAPET SHEATHING

- A. Plywood Sheathing: Either DOC PS 1 or DOC PS 2, Exterior, Structural I sheathing.
1. Span Rating: Not less than 16/0.
- B. Nominal Thickness: Not less than 15/32 inch.

2.04 WALL SHEATHING

- A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corporation; GlasRoc.
 - b. Georgia-Pacific Building Products; Dens-Glass Gold.
 - c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
 - d. United States Gypsum Company; Securock.
 2. Type and Thickness: Regular, 1/2 inch thick.

2.05 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. For roof, parapet, and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

SHEATHING

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Phase I: 100% Construction Documents

- C. Screws for Fastening Sheathing to Wood Framing: ASTM C 1002.
- D. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
 - 1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.06 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
 - 1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 - 2. ICC-ES evaluation report for fastener.
- D. Coordinate wall, parapet and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.02 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Screw to cold-formed metal framing.
 - b. Space panels 1/8 inch apart at edges and ends.

3.03 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
 - 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
 - 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fas-

teners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3. Joint treatment may be omitted upon the written recommendation of the air barrier manufacturer and Architect's approval

END OF SECTION

SHEATHING

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SECTION 06 40 00
WOOD-VENEER PANELS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Wood-veneer-faced panels.
 - 2. Wood furring, blocking, shims, and hanging strips for installing architectural panels.
- B. Related Sections include:
 - 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets concealed within other construction before cabinet installation.
 - 2. Division 12 countertop sections for countertops installed on wood-veneer-faced architectural cabinets.

1.02 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded panels.

1.03 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: For architectural cabinets.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show large-scale details.
 - 3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.

4. Show locations and sizes of cutouts and holes for items installed in architectural cabinets.
- C. Samples: For each exposed product and for each color and finish specified, in manufacturer's or fabricator's standard size.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
 1. Shop Certification: AWI's Quality Certification Program accredited participant.
- B. Installer Qualifications: Fabricator of products.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1.06 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install panels until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Established Dimensions: Where panels are indicated to fit to other construction, establish dimensions for areas where panels are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Wood Veneer Panels
 1. Species: Walnut
 2. Cut: Quarter sawn.
 3. Matching of Veneer Leaves: Mixmatch.
 4. Size: as indicated on drawings
 5. Veneer Thickness: 1mm
 6. Panel Thickness:
 - 19mm panel. One or two sided panels. (The single-sided panels have a backing of technical veneer in order to guarantee stability as well as a perfect protection against moisture.
 - a. 1mm laminate. (Backing made up of several phenolic resin impregnated core layers: 0.4 mm. Top layer of wood veneer: 0.6 mm)

- B. Finish: Finish following AWS section 5 standards.
- C. Accessory Materials:
 - 1. Edge Tape
 - a. 0.6mm veneer edge tape
 - b. ABS edge tape
 - 1) 1 mm x 24mm and 48mm
- D. Substrates and Balancing Sheets:
 - 1. Wood veneer must be laminated to MDF, Particleboard, Plywood or other suitable substrate.
 - 2. Balancing sheets of similar thickness and material are recommended for balanced construction to prevent warping.
- E. Fabrication: Comply with manufacturer's recommendations and fabrication and finishing instructions.
 - 1. All wood veneers will fade or change color with a strong light source exposure.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Examine existing conditions to determine that they are suitable for installation.

3.02 INSTALLATION:

- A. Precondition materials for a period of 5-7 days in the environment that they will be fabricated in.

3.03 CLEANING:

- A. Clean surfaces in accordance with the manufacturer's instructions.

END OF SECTION

SECTION 06 41 16
PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Plastic-laminate-faced architectural cabinets.
 - 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets that are not concealed within other construction.
- B. Related Sections include:
 - 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
 - 2. Division 12 sections for countertops installed over plastic-laminate-faced architectural cabinets.

1.02 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.03 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For plastic-laminate-faced architectural cabinets.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show large-scale details.
 - 3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.

C. Samples for Verification: For the following:

1. Plastic Laminates: 8 by 10 inches, for each type, color, pattern, and surface finish required.
 - a. Provide one sample applied to core material with specified edge material applied to one edge.
2. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of products.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockups of typical architectural cabinets as shown on Drawings.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.08 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed or concealed by construction, and indicate measurements on Shop Drawings.

- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.01 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Grade: Premium.
- C. Type of Construction: As indicated on Drawings.
- D. Door and Drawer-Front Style: As indicated on Drawings.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 2. Basis of Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product approved by Architect by one of the following:
 - a. Abet Laminati Inc.
 - b. Formica Corporation.
 - c. Lamin-Art, Inc.
 - d. Pionite; a Panolam Industries International, Inc. brand.
 - e. Wilsonart.
- F. Laminate Cladding for Exposed Surfaces: Refer to Interior Finish Schedule for selections.
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Vertical Surfaces: Grade HGS.
 - 3. Edges: Grade HGS.
- G. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
 - a. Edges of Plastic-Laminate Shelves: Grade HGS.

- b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.
- 2. Drawer Sides and Backs: Solid-hardwood lumber.
 - 3. Drawer Bottoms: Hardwood plywood.
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued dovetail joints.
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces as indicated by laminate manufacturer's designations, or if not indicated, as selected by Architect from laminate manufacturer's full range of solid colors, matte finish.

2.02 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 8 to 13 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
 - 2. Particleboard: Not permitted.
 - 3. Softwood Plywood: DOC PS 1, medium-density overlay.

2.03 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087100 "Door Hardware."
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Accuride International.
 - 2. Blum, Julius & Co., Inc.
 - 3. Knappe & Vogt Manufacturing Company.
- C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening.
- A. Bar Pulls: Back mounted, solid metal, 6 inches long, matte black.

- D. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- E. Drawer Slides: BHMA A156.9.
 - 1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer.
 - a. Type: Full extension, soft close.
 - b. Material: Zinc-plated steel with polymer rollers.
 - 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 - 3. For drawers not more than 6 inches high and not more than 24 inches wide, provide Grade 1.
 - 4. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
- F. Door Locks: BHMA A156.11, E07121.
- G. Drawer Locks: BHMA A156.11, E07041.
- H. Door and Drawer Silencers: BHMA A156.16, L03011.
- I. Grommets for Cable Passage: 1-1/4-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Color: As selected by Architect from manufacturer's full range.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.
 - 2. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.04 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.05 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for

shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
 2. 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 that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.02 INSTALLATION

- A. Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.03 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Extruded polystyrene foam-plastic board.
 - 2. Mineral-wool blanket.
- B. Related Sections include:
 - 1. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes
 - 2. Section 071416 “Cold Fluid-Applied Waterproofing” for insulated drainage panels installed with plaza deck insulation.
 - 3. Section 07 54 23 “Thermoplastic-Polyolefin (TPO) Roofing” for insulation specified as part of roofing construction.
 - 4. Section 09 81 29 “Sprayed Acoustical Insulation” for self-supported, spray applied insulation.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Include Environmental Product Declaration and Green Label Certificates for Green Globes Certification

1.03 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.04 QUALITY ASSURANCE

- A. Mockups: Provide thermal insulation required to construct integrated exterior mockup specified in Division 01 Section “Mockups.”

1.05 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.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to

Project site until just before installation time.

3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.01 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.02 POLYISOCYANURATE FOAM-PLASTIC BOARD

- A. Polyisocyanurate Board, Glass-Fiber-Mat Faced: ASTM C 1289, glass-fiber-mat faced, Type II, Class 2.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Atlas Roofing Corporation.
 - b. Carlisle Coatings & Waterproofing Inc.
 - c. Firestone Building Products.
 - d. Hunter Panels.
 - e. Rmax, Inc.
 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.03 MINERAL-WOOL BLANKETS

- A. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Johns Manville; a Berkshire Hathaway company.
- b. Rockwool International.
- c. Thermafiber, Inc.; an Owens Corning company.

2.04 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.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.01 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.

3.02 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. 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.

3.03 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
 - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.

2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.04 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 04 Section "Masonry Veneer."

3.05 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: 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 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, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.06 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

SECTION 07 84 13
PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.

1.02 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.04 INFORMATIONAL SUBMITTALS

- A. Product test reports.

1.05 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency acceptable to the authorities having jurisdiction.

2.02 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 1. Basis of Design: Design is based on products listed in UL Design Numbers indicated on Drawings. Subject to compliance with requirements, provide named products or products approved by Architect by one of the following:
 - a. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. Passive Fire Protection Partners.
 - d. RectorSeal.
 - e. Specified Technologies, Inc.
 - f. Tremco, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- D. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.02 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.03 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION

SECTION 07 84 43

JOINT FIRESTOPPING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Joints in or between fire-resistance-rated constructions.
 - 2. Joints at exterior curtain-wall/floor intersections.

1.02 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.04 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.

2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Joint firestopping systems shall bear classification marking of a qualified testing agency acceptable to the authorities having jurisdiction.

2.02 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
 1. Basis of Design: Design is based on products listed in UL Design Numbers indicated on Drawings. Subject to compliance with requirements, provide named products or comparable products approved by the Architect by one of the following:
 - a. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. Passive Fire Protection Partners.
 - d. RectorSeal.
 - e. Specified Technologies, Inc.
 - f. Thermafiber, Inc.; an Owens Corning company.
 - g. Tremco, Inc.
 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E 2307.
 1. Basis of Design: Design is based on products listed in UL Design Numbers indicated on Drawings. Subject to compliance with requirements, provide named products or comparable products approved by the Architect by one of the following:
 - a. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. RectorSeal.
 - d. Specified Technologies, Inc.
 - e. Thermafiber, Inc.; an Owens Corning company.
 - f. Tremco, Inc.
 2. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
- D. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

- E. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- C. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- D. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
 - 3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.02 IDENTIFICATION

- A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.03 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.04 CLEANING AND PROTECTION

- A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Silicone joint sealants.
 - 2. Nonstaining silicone joint sealants.
 - 3. Urethane joint sealants.
 - 4. Mildew-resistant joint sealants.
 - 5. Latex joint sealants.
- B. Related Sections include Section 07 92 19 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

1.02 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.04 INFORMATIONAL SUBMITTALS

- A. Field-adhesion-test reports.
- B. Sample warranties.

1.05 QUALITY ASSURANCE

- A. Mockups: Provide exterior joint sealants and accessories required to construct integrated exterior mockup specified in Division 01 Section "Mockups."

1.06 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.07 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period:
 - a. Silicone Sealants: Ten years from date of Substantial Completion.
 - b. Other Sealants: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.01 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.02 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
- Dow Corning Corporation; 791.
 - GE Construction Sealants; Momentive Performance Materials Inc.; SCS2000 SilPruf.
 - Pecora Corporation; PCS.
 - Sika Corporation; Sikasil WS-295 or Sikasil WS-295 FPS.

2.03 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
- B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
- Dow Corning Corporation; 795.
 - GE Construction Sealants; Momentive Performance Materials Inc.; Silpruf NB.
 - Pecora Corporation; 895NST or 898NST.
 - Tremco Incorporated; Spectrem 2 or Spectrem 3.

2.04 URETHANE JOINT SEALANTS

- A. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
- BASF Construction Chemicals - Construction Systems; Sonolastic SL 1.
 - Pecora Corporation; NR-201.
 - Sherwin-Williams Company (The); Stampede 1SL.
- B. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 50, Uses T and NT.

JOINT SEALANTS

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Phase I: 100% Construction Documents

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. LymTal International Inc; Iso-Flex 888QC.

2.05 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - a. Dow Corning Corporation; 786-M White.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
 - c. Tremco Incorporated; Tremsil 200.

2.06 POLYSULFIDE JOINT SEALANTS

- A. Polysulfide, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, polysulfide joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Sika Corporation Sika Duoflex SL.
 - b. W. R. Meadows, Inc.

2.07 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - a. BASF Construction Chemicals - Construction Systems; Sonolac.
 - b. Pecora Corporation; AC-20.
 - c. Sherwin-Williams Company (The); 950A Siliconized Acrylic Latex Caulk, White PowerHouse Siliconized Acrylic Latex Sealant.
 - d. Tremco Incorporated; Tremflex 834.

2.08 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 - 1. Provide any of the following types, as approved in writing by joint-sealant manufacturer for joint application indicated:
 - a. Type C (closed-cell material with a surface skin).
 - b. Type O (open-cell material).
 - c. Type B (bicellular material with a surface skin).
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.09 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.

JOINT SEALANTS

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Phase I: 100% Construction Documents

- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.02 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.03 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each 1000 feet of joint length thereafter or one 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.

- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.04 JOINT-SEALANT SCHEDULE

- A. Exterior joints in horizontal traffic surfaces.
1. Joint Locations:
 - a. Isolation and contraction joints in cast-in-place concrete slabs.
 - b. Joints in unit paving.
 - c. Joints between different materials listed above.
 - d. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, M, P, 50, T, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Exterior joints in vertical surfaces and horizontal nontraffic surfaces where one or both substrates are porous.
1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Control and expansion joints in masonry veneer.
 - c. Joints in exterior insulation and finish systems.
 - d. Joints in fiber cement panels.
 - e. Joints in wood trim.
 - f. Joints between different materials listed above.
 - g. Joints between materials listed above and frames of doors and windows.
 - h. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Interior joints in horizontal traffic surfaces except as otherwise indicated.
1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in ceramic tile flooring.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, S, P, 25, T, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Interior joints in horizontal traffic surfaces of resinous flooring.

1. Joint Sealant: Polysulfide, M, P, 25, T, NT.
 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
1. Joint Locations:
 - a. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - b. Other joints as indicated on Drawings.
 2. Joint Sealant: Acrylic latex.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints in bathrooms where indicated.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- G. Joint-Sealant Application: Concealed mastics.
1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.

END OF SECTION

SECTION 07 92 19
ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes acoustical joint sealants.
- B. Related Sections include:
 - 1. Division 07 Section "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.02 ACTION SUBMITTALS

- A. Product Data: For each acoustical joint sealant.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of acoustical joint sealant required.
- D. Acoustical-Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.03 INFORMATIONAL SUBMITTALS

- A. Sample Warranties: For special warranties.

1.04 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.

2.02 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Accumetric LLC.
 - b. Franklin International.
 - c. GE Construction Sealants; Momentive Performance Materials Inc.
 - d. Grabber Construction Products.
 - e. Hilti, Inc.
 - f. Pecora Corporation.
 - g. Tremco Incorporated.
 - h. United States Gypsum Company.
 - 2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

2.03 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.02 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies.

3.03 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.04 PROTECTION

- A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Interior standard steel doors and frames.
 - 2. Interior standard steel frames to receive wood doors.
 - 3. Exterior standard steel doors and frames.
- B. Related Sections include:
 - 1. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes.
 - 2. Division 08 Section “Door Hardware” for door hardware for hollow-metal doors.

1.02 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.03 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.04 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.

3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of each different wall opening condition.
 6. Details of anchorages, joints, field splices, and connections.
 7. Details of accessories.
 8. Details of moldings, removable stops, and glazing.
 9. Details of conduit and preparations for power, signal, and control systems.
- C. Samples for Initial Selection: For hollow-metal doors and frames with factory-applied color finishes.
- D. Samples for Verification:
1. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
 2. Fabrication: Prepare Samples approximately 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
 - a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
 - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.
- E. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.
- F. Include Environmental Product Declaration and Green Label Certificates for Green Globes Certification.

1.06 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Black Mountain Door, LLC.
 - 2. Ceco Door; ASSA ABLOY.
 - 3. Republic Doors and Frames.
 - 4. Rocky Mountain Metals, Inc.
 - 5. Steelcraft; an Allegion brand.
- B. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.40 deg Btu/F x h x sq. ft. when tested according to ASTM C518.

2.02 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

2.03 INTERIOR STANDARD STEEL FRAMES

- A. Construct frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Frames: SDI A250.8, Level 2; SDI A250.4, Level B.
 - 1. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch.
 - 2. Construction: Full profile welded.

2.04 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; ANSI/SDI A250.4, Level B.
 - 1. Physical Performance: Level B according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
 - d. Edge Construction: Model 2, Seamless.
 - e. Edge Bevel: Bevel lock and hinge edges 1/8 inch in 2 inches.

- f. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
- 3. Frames:
 - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
 - b. Construction: Full profile welded.
- 4. Exposed Finish: Prime.

2.05 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3; ANSI/SDI A250.4, Level A.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Edge Bevel: Bevel lock and hinge edges 1/8 inch in 2 inches.
 - f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
 - g. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
 - h. Core: Manufacturer's standard polystyrene, polyurethane, or polyisocyanurate, core at manufacturer's discretion.
 - 3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
 - b. Construction: Full profile welded.
 - 4. Exposed Finish: Prime.

2.06 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.

2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
 3. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.07 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- H. Glazing: Comply with requirements in Division 08 Section "Glazing."
- I. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.08 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted hairline joints.
 - 1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
 - 2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
 - 3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 - 4. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.09 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.02 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11.
 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 2. Fire-Rated Openings: Install frames according to NFPA 80.
 3. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 4. Metal Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

- c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 - 1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow-metal manufacturer's written instructions.

3.03 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Solid-core doors with plastic-laminate faces.
 - 2. Factory fitting flush wood doors to frames and factory machining for hardware.

1.02 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of door indicated.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
 - 1. Dimensions and locations of blocking.
 - 2. Dimensions and locations of mortises and holes for hardware.
 - 3. Dimensions and locations of cutouts.
 - 4. Undercuts.
 - 5. Fire-protection ratings for fire-rated doors.
- C. Samples:
 - 1. Plastic laminate and Wood Veneer, 6 inches square, for each color, texture, and pattern selected.
 - 2. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.04 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.06 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.07 WARRANTY

- A. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Algoma Hardwoods, Inc.
 2. Eggers Industries.
 3. Graham Wood Doors; ASSA ABLOY Group company.
 4. Marshfield DoorSystems, Inc.
 5. VT Industries Inc.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.02 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
- B. Structural-Composite-Lumber-Core Doors:
1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf.
 - b. Screw Withdrawal, Edge: 400 lbf.
- C. Particleboard-Core Doors: Not permitted.

2.03 PLASTIC-LAMINATE-FACED DOORS

A. Interior Solid-Core Doors:

1. Grade: Premium.
2. Plastic-Laminate Faces: High-pressure decorative laminates complying with NEMA LD 3, Grade HGS.
3. Colors, Patterns, and Finishes: As scheduled.
4. Exposed Vertical Edges: Plastic laminate that matches faces, applied before faces.
5. Core: Structural composite lumber.
6. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before faces and crossbands are applied. Faces are bonded to core using a hot press.

2.04 WOOD VENEER-FACED DOORS

B. Interior Solid-Core Doors:

1. Grade: Premium.
2. Wood Veneer Faces: As scheduled.
3. Colors, Patterns, and Finishes: As scheduled.
4. Exposed Vertical Edges: Plastic laminate that matches faces, applied before faces.
5. Core: Structural composite lumber.
6. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before faces and crossbands are applied. Faces are bonded to core using a hot press.

2.05 PRIMED DOORS

C. Interior Solid-Core Doors:

1. Grade: Premium.
2. Faces: Factory primed, painted in the field.
3. Colors, Patterns, and Finishes: As scheduled.
4. Exposed Vertical Edges: Factory primed, painted in the field.
5. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before faces and crossbands are applied. Faces are bonded to core using a hot press.

2.06 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Manufacturer's standard shape.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

2.07 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
 1. Locate hardware to comply with DHI-WDHS-3.
 2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
 3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
 4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
 5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Openings: Factory cut and trim openings through doors.
 1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing"

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Hardware: For installation, see Division 08 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 1. Clearances:
 - a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
 - b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
 - c. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - d. Comply with NFPA 80 for fire-rated doors.

- 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.03 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 31 13
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Samples: For each door face material.
- D. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.01 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Acudor Products, Inc.
 - 2. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - 3. Karp Associates, Inc.
 - 4. Larsens Manufacturing Company.
 - 5. MIFAB, Inc.
 - 6. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - 7. Nystrom, Inc.
- B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- C. Factory-Primed Flush Access Doors with Hidden Flanges:
 - 1. Basis-of-Design Product: Acudor Products, Inc., model DW-5040
 - 2. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width hidden flange, proportional to door size.
 - 3. Locations: Wall and ceiling.

4. Door Size: As required to access valve or damper, but not less than 12 inches square.
 5. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage.
 - a. Finish: Factory prime.
 6. Frame Material: Same material, thickness, and finish as door.
 7. Hinges: Manufacturer's standard.
 8. Hardware: Cam latch operated by pinned-hex-head wrench or by spanner-head wrench.
- D. Stainless Steel Flush Access Doors with Exposed Flanges:
1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
 2. Locations: Food service and service areas.
 3. Door Size: As required to access valve or damper, but not less than 12 inches square.
 4. Stainless-Steel Sheet for Door: Nominal 0.062 inch, 16 gage.
 - a. Finish: No. 4.
 5. Frame Material: Same material, thickness, and finish as door.
 6. Hinges: Manufacturer's standard.
 7. Hardware: Cam latch operated by pinned-hex-head wrench or by spanner-head wrench.
- E. Recessed Access Doors with Concealed Flanges:
1. Description: Door face recessed 1/2 inch for ceramic tile infill; with concealed flange for gypsum board installation and concealed hinge.
 2. Locations: Wall at restrooms.
 3. Door Size: As required to access valve or damper, but not less than 12 inches square.
 4. Stainless Steel Sheet for Door: Nominal 0.062 inch, 16 gage, finish.
 5. Hinges: Manufacturer's standard.
 6. Hardware: Cam latch operated by pinned-hex-head wrench or by spanner-head wrench.

2.02 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines or blend into finish.

- E. Frame Anchors: Same type as door face.
- F. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.03 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- D. Latch and Lock Hardware:
 - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 - 2. Keys: Furnish two keys per lock and key all locks alike.

2.04 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Stainless-Steel Finishes:
 - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - 2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - c. Directional Satin Finish: No. 4.
- E. Steel and Metallic-Coated-Steel Finishes:
 - 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.02 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 08 41 26
ALL-GLASS ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Interior all-glass entrance and storefront systems.
- B. Related Sections include:
 - 1. Division 05 Section "Metal Fabrications" for overhead-steel support for all-glass systems.
 - 2. Division 08 Section "Door Hardware."
 - 3. Division 08 Section, "Glazing."

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all-glass system.
- B. Shop Drawings: For all-glass entrances and storefronts.
 - 1. Include plans, elevations, and sections.
 - 2. Include details of fittings and glazing, including isometric drawings of fittings.
 - 3. Door hardware locations, mounting heights, and installation requirements.
- C. Samples for Initial Selection: For each type of exposed finish indicated.
- D. Samples for Verification: For each type of exposed finish indicated, prepared on Samples of sizes indicated below:
 - 1. Metal Finishes: 6-inch-long sections of fittings, and other items.
 - 2. Glass: 6 inches square, showing exposed-edge finish.
 - 3. Door Hardware: For exposed door hardware of each type, in specified finish, full size.
- E. Fabrication Sample: Patch fitting at sill on pivot side only, made from 12-inch lengths of full-size components and showing details of the following:
 - 1. Joinery.
 - 2. Anchorage.

3. Glazing with butt glazing.
- F. Entrance Door Hardware Schedule: Refer to Division 08 Section "Door Hardware."
- G. Delegated-Design Submittal: For all-glass systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.03 INFORMATIONAL SUBMITTALS

- A. Qualification Data:
 1. For Installer.
 2. For testing agency.
 3. For egress door inspector.
 - a. Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
 - b. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Product Test Reports: For all-glass systems, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranty: For special warranty.

1.04 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For all-glass systems to include in maintenance manuals. Furnish a complete set of specialized tools and maintenance instructions as required for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation of units required for this Project.
- B. Testing Agency Qualifications: Qualified according to ASTM E699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.
 1. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 - a. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.06 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical all-glass system as indicated on Drawings.
 - 2. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 WARRANTY

- A. Special Warranty: Manufacturer and Installer agrees to repair or replace components of all-glass systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - c. Failure of operating components.
 - 2. Warranty Period: Two years from date of Substantial Completion for assembly and components unless otherwise indicated.
 - a. Concealed Floor Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide product system approved by Architect by one of the following:

1. C.R. Lawrence Co., Inc.
2. Dormakaba, USA

- B. Source Limitations: Obtain all components of all-glass entrances and storefront system, including framing and accessories, from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design all-glass entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of all-glass entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
 3. Deflection Limits: Deflection normal to glazing plane is limited to 1/175 of clear span or 3/4 inch, whichever is smaller.
- D. Seismic Performance: All-glass entrances and storefronts shall withstand the effects of earthquake motions for Seismic Design Category C determined according to ASCE/SEI 7.
- E. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.03 GLASS

- A. Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), Quality-Q3, tested for surface and edge compression in accordance with ASTM C1048 and for impact strength in accordance with 16 CFR 1201 for Category II materials.
1. Class 1: Clear laminated
 - a. Total Thickness: 12 mm with clear pvb interlayer.
 - b. Location: private offices, conference rooms
 2. Exposed Edges: Machine ground and flat polished.
 3. Butt Edges: Flat ground.
 4. Corner Edges: Lap-joint corners with exposed edges polished.

2.04 ENTRANCE DOOR HARDWARE

- A. General: Entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of fittings.
- B. Concealed Floor Closers and Top Pivots: Center hung; ANSI/BHMA A156.4, Grade 1; including cases, bottom arms, top walking beam pivots, plates, and accessories required for complete installation.
 - 1. Swing: Single Narrow Stile
 - a. Positive Dead Stop: Coordinated with hold-open angle if any, or at angle selected.
 - 2. Hold Open: Automatic, at angle selected.
 - 3. Opening Force Requirements:
 - a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.
 - 4. Balance of Hardware: Refer to Division 08 Section "Finish Hardware."

2.05 BUTT-GLAZING SEALANTS

- A. Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Uses NT, G, and A.

2.06 FABRICATION

- A. Provide holes and cutouts in glass to receive hardware, fittings, and accessory fittings before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.
 - 1. Fully temper glass using horizontal (roller-hearth) process, and fabricate so that when glass is installed, roll-wave distortion is parallel with bottom edge of door or lite.
- B. Factory assemble components and factory install hardware and fittings to greatest extent possible.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION OF ALL-GLASS ENTRANCE AND STOREFRONT SYSTEMS

- A. Install all-glass entrance and storefront systems and associated components according to manufacturer's written instructions.
- B. Set units level, plumb, and true to line, with uniform joints.
- C. Maintain uniform clearances between adjacent components.
- D. Lubricate hardware and other moving parts according to manufacturer's written instructions.
- E. Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.
- F. Install butt-joint sealants according to manufacturer's written instructions and as specified in Section 07 92 00 "Joint Sealants" to produce weathertight installation.

3.03 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform the following tests and inspections:
 - 1. Egress Door Inspections: Inspect each all-glass entrance door equipped with panic hardware, each all-glass entrance door located in an exit enclosure, each electrically controlled all-glass egress door, and each all-glass entrance door equipped with special locking arrangements, according to NFPA 101, Section 7.2.1.15.
- B. All-glass entrances and storefronts will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.04 ADJUSTING AND CLEANING

- A. Adjust all-glass entrance doors and hardware to produce smooth operation and tight fit at contact points and weather stripping.
 - 1. For all-glass entrance doors accessible to people with disabilities, adjust closers to provide a three-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.
- B. Remove excess sealant and glazing compounds and dirt from surfaces.

END OF SECTION

SECTION 08 42 29.23
SLIDING AUTOMATIC ENTRANCES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes exterior and interior, sliding, power-operated automatic entrances.
- B. Related sections include:
 - 1. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes

1.02 DEFINITIONS

- A. AAADM: American Association of Automatic Door Manufacturers.
- B. For automatic door terminology, refer to BHMA A156.10 for definitions of terms.

1.03 COORDINATION

- A. Templates: Distribute for doors, frames, and other work specified to be factory prepared for installing automatic entrances.
- B. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Coordinate hardware for automatic entrances with hardware required for rest of Project.
- C. Electrical System Roughing-in: Coordinate layout and installation of automatic entrances with connections to power supplies and access-control system and remote activation devices.
- D. System Integration: Integrate sliding automatic entrances with other systems as required for a complete working installation.
 - 1. Provide electrical interface control capability for activation of sliding automatic entrances by security access system on doors with electric locking.
 - 2. Provide electrical interface to deactivate door operators on activation of fire alarm system.
 - 3. Provide electrical interface to allow for remote monitoring of automatic entrance door panel status.

1.04 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic entrances.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For sliding automatic entrances.
 - 1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
 - 2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.
 - 4. Indicate locations of activation and safety devices.
 - 5. Include hardware schedule and indicate hardware types, functions, quantities, and locations.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- D. Delegated-Design Submittal: For automatic entrances.
- E. Include Environmental Product Declaration and Green Label Certificates for Green Globes Certification

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of automatic entrance. Include emergency-exit features of automatic entrances serving as a required means of egress.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturer's special warranties.

1.07 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For automatic entrances, safety devices, and control systems to include in operation and maintenance manuals.

1.08 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer with Company Certificate issued by AAADM indicating that manufacturer has a Certified Inspector on staff.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation and maintenance of units required for this Project and who employs a Certified Inspector.

1. Maintenance Proximity: Not more than one hour's normal travel time from Installer's place of business to Project site.
- C. Certified Inspector Qualifications: Certified by AAADM.

1.09 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of automatic entrances that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Faulty operation of operators, controls, and hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 AUTOMATIC ENTRANCE ASSEMBLIES

- A. Source Limitations: Obtain sliding automatic entrances from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Power-Operated Door Standard: BHMA A156.10.

2.02 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design automatic entrances.
- B. Structural Performance: Automatic entrances shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 1. Wind Loads: As indicated on Structural Drawings.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- D. Operating Temperature Range: Automatic entrances shall operate within minus 20 to plus 122 deg F.

E. Opening Force:

1. Power-Operated Doors: Not more than 50 lbf required to manually set door in motion if power fails, and not more than 15 lbf required to open door to minimum required width.
2. Breakaway Device for Power-Operated Doors: Not more than 50 lbf required for a breakaway door or panel to open.

F. Entrapment-Prevention Force:

1. Power-Operated Sliding Doors: Not more than 30 lbf required to prevent stopped door from closing.

2.03 SLIDING AUTOMATIC ENTRANCES

A. General: Provide manufacturer's standard automatic entrances, including doors, sidelites, framing, headers, carrier assemblies, roller tracks, door operators, controls, and accessories required for a complete installation.

B. Sliding Automatic Entrance:

1. Single-Sliding Units:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Besam Entrance Solutions; an ASSA ABLOY Group Company.
 - 2) DORMA USA, Inc.
 - 3) Horton Automatics; a division of Overhead Door Corporation.
 - 4) NABCO Entrances, Inc.
 - 5) Stanley Access Technologies.
 - 6) Tormax Technologies, Inc.
2. Configuration: Single-sliding door with one sliding leaf and sidelite.
 - a. Traffic Pattern: Two way.
 - b. Emergency Breakaway Capability: As indicated on Drawings.
 - c. Mounting: Between jambs.
3. Operator Features:
 - a. Power opening and closing.
 - b. Drive System: Chain or belt.
 - c. Adjustable opening and closing speeds.
 - d. Adjustable hold-open time between zero and 30 seconds.
 - e. Obstruction recycle.
 - f. On-off/hold-open switch to control electric power to operator, key operated.
4. Sliding-Door Carrier Assemblies and Overhead Roller Tracks: Carrier assembly that allows vertical adjustment; consisting of nylon- or delrin-covered, ball-bearing-center steel wheels operating on a continuous roller track, or ball-bearing-center steel

SLIDING AUTOMATIC ENTRANCES

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Phase I: 100% Construction Documents

wheels operating on a nylon- or delrin-covered, continuous roller track. Support doors from carrier assembly by cantilever and pivot assembly.

- a. Rollers: Minimum of two ball-bearing roller wheels and two antirise rollers for each active leaf.
- 5. Sliding-Door Threshold: Threshold members and bottom-guide-track system with stainless-steel, ball-bearing-center roller wheels.
 - a. Configuration: Saddle-type threshold across door opening and **recessed** guide-track system at sidelites.
 - b. Configuration: No threshold across door opening and **recessed** guide-track system at sidelites.
- 6. Controls: Activation and safety devices as indicated on Drawings and according to BHMA standards.
 - a. Activation Device: Motion sensor mounted on each side of door header to detect pedestrians in activating zone and to open door.
 - b. Safety Device: Presence sensor mounted on each side of door header and two photoelectric beams mounted in sidelite jambs on one side of the door to detect pedestrians in presence zone and to prevent door from closing.
- 7. Finish: Finish framing, door(s), and header with Class I, clear anodic finish.

2.04 ENTRANCE COMPONENTS

- A. Framing Members: Extruded aluminum, minimum 0.125 inch thick and reinforced as required to support imposed loads.
 - 1. Nominal Size: As indicated on Drawings.
 - 2. Extruded Glazing Stops and Applied Trim: Minimum 0.062-inch wall thickness.
- B. Stile and Rail Doors: 1-3/4-inch-thick, glazed doors with minimum 0.125-inch-thick, extruded-aluminum tubular stile and rail members. Mechanically fasten corners with reinforcing brackets that are welded, or incorporate concealed tie-rods that span full length of top and bottom rails.
 - 1. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - 2. Stile Design: Thin stile, less than 1-3/4-inch nominal width.
 - 3. Rail Design: As indicated on Drawings.
- C. Headers: Fabricated from minimum 0.125-inch-thick extruded aluminum and extending full width of automatic entrance units to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
 - 1. Mounting: Concealed, with one side of header flush with framing.

2. Capacity: Capable of supporting doors of up to 175 lb per leaf over spans of up to 14 feet without intermediate supports.

- a. Provide sag rods for spans exceeding 14 feet.

- D. Brackets and Reinforcements: High-strength aluminum with nonstaining, nonferrous shims for aligning system components.

- E. Signage: As required by cited BHMA standard.

1. Application Process: Silk-screened.

2.05 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extrusions: ASTM B221.
 2. Sheet: ASTM B209.

- B. Steel Reinforcement: Reinforcement with corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Use surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

- C. Stainless-Steel Bars: ASTM A276/A276M or ASTM A666, type 304.

- D. Stainless-Steel Tubing: ASTM A554, Grade MT 304.

- E. Stainless-Steel Sheet: ASTM A240/A240M or ASTM A666, type 304, stretcher-leveled standard of flatness, in entrance manufacturer's standard thickness.

- F. Glazing: As specified in Section 088000 "Glazing."

- G. Sealants and Joint Fillers: As specified in Section 079200 "Joint Sealants."

- H. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout; complying with ASTM C1107/C1107M; of consistency suitable for application.

- I. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

- J. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.06 DOOR OPERATORS AND CONTROLS

- A. General: Provide operators and controls, which include activation and safety devices, according to BHMA standards, for condition of exposure, and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.

- B. Door Operators: Provide door operators of size recommended by manufacturer for door size, weight, and movement.
 - 1. Door Operator Performance: Door operators shall open and close doors and maintain them in fully closed position when subjected to Project's design wind loads.
 - 2. Electromechanical Operators: Concealed, self-contained, overhead units powered by fractional-horsepower, permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor; with solid-state microprocessor controller; complying with UL 325; and with manual operation with power off.
- C. Motion Sensors: Self-contained, K-band-frequency, microwave-scanner units; fully enclosed by their plastic housings; adjustable to provide detection-field sizes and functions required by BHMA A156.10.
 - 1. Provide capability for switching between bi- and unidirectional detection.
 - 2. For one-way traffic, sensor on egress side shall not be active when doors are fully closed.
- D. Presence Sensors: Self-contained, active-infrared scanner units; adjustable to provide detection-field sizes and functions required by BHMA A156.10. Sensors shall remain active at all times.
- E. Photoelectric Beams: Pulsed infrared, sender-receiver assembly for recessed mounting. Beams shall not be active when doors are fully closed.
- F. Key Switch: Recess-mounted, door-control switch with key-controlled actuator; enclosed in 2-by-4-inch junction box. Provide faceplate engraved with letters indicating switch functions.
 - 1. Faceplate Material: Stainless steel, as selected by Architect from manufacturer's full range.
 - 2. Functions: On-off, maintained contact.
 - 3. Mounting: As indicated on Drawings.
- G. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.07 HARDWARE

- A. General: Provide units in sizes and types recommended by automatic entrance and hardware manufacturers for entrances and uses indicated. Finish exposed parts to match door finish.
- B. Breakaway Device for Power-Operated Doors: Device that allows door to swing out in direction of egress to full 90 degrees from any operating position. Maximum force to open door shall be as stipulated in "Performance Requirements" Article. Interrupt powered operation of door operator while in breakaway mode.

- C. Deadlocks: Deadbolt operated by exterior cylinder and interior thumb turn, with minimum 1-inch-long throw bolt; BHMA A156.5, Grade 1.
 - 1. Cylinders: As specified in Section 087100 "Door Hardware."
 - a. Keying: Integrate into building master key system.
 - 2. Deadbolts: Laminated-steel hook, mortise type, BHMA A156.5, Grade 1.
- D. Dustproof Strikes for All-Glass Sliding Doors: As specified in Section 087100 "Door Hardware."
- E. Weather Stripping: Replaceable components.
 - 1. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.08 FABRICATION

- A. General: Factory fabricate automatic entrance components to designs, sizes, and thicknesses indicated and to comply with indicated standards.
 - 1. Form aluminum shapes before finishing.
 - 2. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
 - 3. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, fabricated from stainless steel.
 - a. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 - b. Reinforce members as required to receive fastener threads.
 - 4. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
- B. Framing: Provide automatic entrances as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site.
 - 1. Fabricate tubular and channel frame assemblies with welded or mechanical joints. Provide subframes and reinforcement as required for a complete system to support required loads.
 - 2. Perform fabrication operations in manner that prevents damage to exposed finish surfaces.
 - 3. Form profiles that are sharp, straight, and free of defects or deformations.
 - 4. Provide components with concealed fasteners and anchor and connection devices.
 - 5. Fabricate components with accurately fitted joints, with ends coped or mitered to produce hairline joints free of burrs and distortion.
 - 6. Fabricate exterior components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior. Provide

- anchorage and alignment brackets for concealed support of assembly from building structure.
- 7. Allow for thermal expansion of exterior units.
- C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.
- D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.
- E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated, according to GANA's "Glazing Manual."
- F. Hardware: Factory install hardware to greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site. Cut, drill, and tap for factory-installed hardware before applying finishes.
 - 1. Provide sliding-type weather stripping, mortised into door, at perimeter of doors.
- G. Controls:
 - 1. General: Factory install activation and safety devices in doors and headers as required by BHMA A156.10 for type of door and direction of travel.
 - 2. Install photoelectric beams in vertical jambs of sidelites, with dimension above finished floor as follows:
 - a. Top Beam: 48 inches.
 - b. Bottom Beam: 24 inches.

2.09 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, header support, and other conditions affecting performance of automatic entrances.
- B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic entrance installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Install automatic entrances according to manufacturer's written instructions and cited BHMA A156.10 for direction of pedestrian travel, including signage, controls, wiring, and connection to the building's power supply.

1. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
 2. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 3. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous coating.
- B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
 2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
 3. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.
 4. Level recesses for recessed thresholds using nonshrink grout.
- C. Door Operators: Connect door operators to electrical power distribution system.
- D. Access-Control Devices: Connect access-control devices to access-control system, as specified in Section 281300 "Access Control Software and Database Management."
- E. Controls: Install and adjust activation and safety devices according to manufacturer's written instructions and cited BHMA standard for direction of pedestrian travel. Connect control wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- F. Glazing: Install glazing as specified in Section 088000 "Glazing."
- G. Sealants: Comply with requirements specified in Section 079200 "Joint Sealants" to provide weathertight installation.
1. Set bottom-guide-track system, framing members and flashings in full sealant bed.
 2. Seal perimeter of framing members with sealant.
- H. Signage: Apply signage on both sides of each door, as required by cited BHMA standard for direction of pedestrian travel.
- I. Wiring within Automatic Entrance Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's written limitations on bending radii. Provide and use lacing bars and distribution spools.

3.03 FIELD QUALITY CONTROL

- A. Certified Inspector: Owner will engage a Certified Inspector to test and inspect components, assemblies, and installations, including connections.

- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Test and inspect each automatic entrance, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.
- C. Automatic entrances will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.04 ADJUSTING

- A. Adjust hardware, moving parts, door operators, and controls to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
 - 1. Adjust exterior doors for tight closure.
- B. Readjust door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).
- C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.05 CLEANING

- A. Clean glass and metal surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish.
 - 1. Comply with requirements in Section 088000 "Glazing" for cleaning and maintaining glass.

3.06 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of automatic entrance Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper automatic entrance operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Engage a Certified Inspector to perform safety inspection after each adjustment or repair and at end of maintenance period. Furnish completed inspection reports to Owner.
 - 2. Perform maintenance, including emergency callback service, during normal working hours.
 - 3. Include 24-hour-per-day, 7-day-per-week, emergency callback service.

3.07 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic entrances.

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Glazing for:
 - a. Existing storefront (Alternate 1)
 - 2. Glazing products include:
 - a. Insulated glazing units with low-e coatings
 - 3. Glazing sealants and accessories.
- B. Related Sections include:
 - 1. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes
 - 2. Section 05 73 13 "Glazed Decorative Metal Railings" for glazing in railings.
 - 3. Section 08 88 13 "Fire-Rated Glazing."
 - 4. Section 08 62 00 "Unit Skylights" for glazing in skylights.
 - 5. Section 10 22 19 "Demountable Partitions" for glazing in demountable partitions.
 - 6. Section 10 22 39.13 "Folding Glass-Panel Partitions" for glazing in folding glass-panel partitions.

1.02 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.03 COORDINATION

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

1.04 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 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. Review temporary protection requirements for glazing during and after installation.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- C. Glazing Schedule: List glass types and thicknesses 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 qualified professional engineer responsible for their preparation.
- E. Include Environmental Product Declaration and Green Label Certificates for Green Globes Certification

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturers of insulating-glass units with sputter-coated, low-E coatings.
- B. Product Certificates: For exterior glazing units.
- C. Sample Warranties: For special warranties.

1.07 QUALITY ASSURANCE

- A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved and certified by primary glass manufacturer.
- B. Mockups: Provide glazing units, glazing materials, and accessories required to construct integrated exterior mockup specified in Division 01 Section "Mockups."

1.08 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. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures or insulating glass deformations due to altitude change.

1.09 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 deg F.

1.10 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

- 1. Warranty Period: 10 years from date of Substantial Completion.

- B. Manufacturer's Special Warranty for Laminated Glass: 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. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

- 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of

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sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

- B. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design glazing including thickness.
- C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the International Building Code and ASTM E 1300.
 - 1. Design Wind Pressures: As indicated on Structural Drawings.
 - 2. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 - 1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 7 computer program, expressed as Btu/sq. ft. x h x deg F.
 - 2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 7 computer program.
 - 3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.02 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
 - 1. Provide label on shop drawings. Locate as indicated by Architect on shop drawing review.
 - 2. Glazing decal to include information required by code or authority having jurisdiction.
 - a. Manufacturer's logo not permitted.
 - b. Use only one font.
 - c. Provide smallest legible font size.

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- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- D. Strength:
 - 1. Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article.
 - 2. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article.
 - 3. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.03 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Ultraclear Annealed Float Glass: ASTM C1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent and SHGC of not less than 0.87.
- C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- D. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- E. Ceramic-Coated Vision Glass: ASTM C1048, Condition C, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3; and complying with Specification No. 95-1-31 in NGA's "Engineering Standards Manual."
- F. Ceramic-Coated Spandrel Glass: ASTM C1048, Type I, Condition B, Quality-Q3.

2.04 LAMINATED GLASS

- A. Insulating glass units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seals
 - 2. Perimeter Spacer: Aluminum, color as selected by Architect
 - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.05 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

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1. Sealing System: Dual seals.
2. Perimeter Spacer: Aluminum; color as selected by Architect.
3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.06 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Dow Corning Corporation; 790.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS2700 SilPruf LM.
 - c. Pecora Corporation; 890NST.
 - d. Sika Corporation; SikaSil WS-290.
 - e. Tremco Incorporated; Spectrem 1.

2.07 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.08 MISCELLANEOUS GLAZING MATERIALS

- A. General: 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 a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.09 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
 - 2. No dirt, dust, or other contaminants allowed in the interlayers or in insulated glazing unit cavities.
 - 3. Remove low-e coating from edges of insulated glazing units to allow adhesion of spacer bars without corrosion or contamination between spacer bar and low-e coating.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 2. Presence and functioning of weep systems.
 3. Minimum required face and edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.03 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass 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.
1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

3.04 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Apply heel bead of elastomeric sealant where indicated.
- F. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.05 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.06 SEALANT GLAZING (WET)

- A. 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

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sealant relative to edge clearance for optimum sealant performance.

- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.07 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.

3.08 MONOLITHIC GLASS SCHEDULE

- A. Clear annealed float glass for typical interior glazing.
 - 1. Minimum Thickness: 6 mm.
- B. Clear annealed fully tempered float glass for interior glazing where safety glazing is required Type GL-3.
 - 1. Minimum Thickness: 12 mm.
 - 2. Safety glazing required.
- C. Ultraclear Glass: Annealed float glass, where indicated on Drawings.
 - 1. Minimum Thickness: 6 mm.
- D. Ultraclear Glass: Annealed Fully tempered float glass for interior glazing where safety glazing is required; where indicated on Drawings.
 - 1. Minimum Thickness: 6 mm.
 - 2. Safety glazing required.
- E. Fire-rated glass up to 90 min Type GL-6:
 - 1. Minimum Thickness: 6 mm.
 - 2. Safety glazing required.

3.09 INSULATING GLASS SCHEDULE

- A. Low-E Coated Clear Insulating Glass Type GL-1:
 - 1. Basis-of-Design Product: Vitro Solarban 90 or equal as determined by the Architect.

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2. Overall Unit Thickness: 1 inch.
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Clear fully tempered float glass or equal.
5. Interspace Content: Air.
6. Indoor Lite: Clear fully tempered float glass or equal.
7. Low-E Coating: Sputtered on second surface.
8. Winter Nighttime U-Factor: 0.29 maximum.
9. Summer Daytime U-Factor: 0.27 maximum.
10. Visible Light Transmittance: 51 percent minimum.
11. SGHC: 0.23 maximum.
12. Safety glazing required.

B. Coated, Low-E Coated Clear Insulating Spandrel Glass Type GL-2.

1. Basis-of-Design Product: Vitro Solarban 90 or equal as determined by the Architect.
2. Spandrel Color: As selected by Architect.
3. Overall Unit Thickness: 1 inch.
4. Minimum Thickness of Each Glass Lite: 6 mm.
5. Outdoor Lite: Clear or equal heat-strengthened float glass. Make fully tempered where required by code. All lites within a single opening shall have identical heat strengthening treatment.
6. Interspace Content: Air.
7. Indoor Lite: Clear heat strengthened float glass. All lites within a single opening shall have identical heat strengthening treatment.
8. Low-E Coating: Sputtered on second surface.
9. Spandrel Location: Fourth surface
10. Winter Nighttime U-Factor: 0.29 maximum for glazing without ceramic coating.
11. Summer Daytime U-Factor: 0.27 maximum for glazing without ceramic coating.
12. Visible Light Transmittance: 64 percent minimum for glazing without ceramic coating.
13. SGHC: 0.27 maximum for glazing without ceramic coating.

END OF SECTION

GLAZING

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SECTION 08 83 00
MIRRORS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
- B. Section includes silvered flat glass mirrors:
 - 1. Annealed monolithic glass mirrors.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.
- C. Samples: For each type of the following:
 - 1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
 - 2. Mirror Clips: Full size.
 - 3. Mirror Trim: 12 inches long.

1.03 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.04 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For mirrors to include in maintenance manuals.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.06 FIELD CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.07 WARRANTY

- A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

- 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Avalon Glass and Mirror Company.
 - 2. Binswanger Mirror; a division of Vitro America, Inc.
 - 3. Guardian Industries Corp.; SunGuard.
 - 4. National Glass Industries.
 - 5. Trulite Glass & Aluminum Solutions, LLC.
- B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.
- C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

2.02 SILVERED FLAT GLASS MIRRORS

- A. Mirrors, General: ASTM C 1503.
- B. Annealed Monolithic Glass Mirrors: Mirror Select Quality, clear.
 - 1. Nominal Thickness: 6.0 mm.

2.03 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Franklin International.
 - b. Laurence, C. R. Co., Inc.
 - c. Liquid Nails Adhesive.
 - d. Pecora Corporation.
 - e. Sommer & Maca Industries, Inc.

2.04 MIRROR HARDWARE

- A. Aluminum J-Channels and Cleat: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.
 - 1. Bottom and Side Trim: J-channels formed with front leg and back leg not less than 5/16 and 3/4 inch in height, respectively.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Laurence, C. R. Co., Inc.
 - 2. Top Trim: Formed with front leg with a height matching bottom trim and back leg designed to fit into the pocket created by wall-mounted aluminum cleat.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Laurence, C. R. Co., Inc.
 - 3. Finish: matte black.
- B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

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- C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.05 FABRICATION

- A. Fabricate mirrors in the shop to greatest extent possible.
- B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Edge Treatment:
 - 1. General:
 - a. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 - b. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.
 - 2. Beveled Mirror Edge Treatment: Beveled polished edge 1 inch wide.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.02 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.03 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

1. GANA Publications: "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- B. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 1. Aluminum J-Channels and Cleat: Fasten J-channel directly to wall and attach top trim to continuous cleat fastened directly to wall.
 2. Install mastic as follows:
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch between back of mirrors and mounting surface.

3.04 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

1. Section includes non-load-bearing steel framing members for non-load-bearing steel framing systems for interior partitions.

1.02 RELATED SECTIONS

2. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include data indicating compliance with performance standards. Clearly indicate on Product Data size and thickness of framing required for each condition.
- B. Include Environmental Product Declaration for Green Globes Certification.

1.04 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.05 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Steel Framing: Metal thicknesses indicated are minimum thickness selected to meet structural design criteria for non-structural, interior partitions. Where metal framing manufacturer's published Product Data recommends a greater thickness for the condition indicated, provide metal framing in recommended thickness.

1. Lateral Load: 5 lbs/sq. ft.
2. Maximum Allowable Deflection:
 - a. Typical Partitions: L/240.
- B. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- C. 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.

2.02 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 2. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized unless otherwise indicated.
- B. Studs and Tracks: ASTM C 645.
 1. Steel Studs and Tracks:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) CEMCO; California Expanded Metal Products Co.
 - 2) ClarkDietrich.
 - 3) MarinoWARE.
 - 4) Phillips Manufacturing Co.
 - 5) The Steel Network, Inc.
 - b. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection.
 - c. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
 1. Single Long-Leg Track System: ASTM C 645 top track with 2-inch-deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 2. Double-Track System: ASTM C 645 top outer tracks, inside track with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
 3. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Manufacturers: Subject to compliance with requirements, available

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manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- 1) CEMCO; California Expanded Metal Products Co.
- 2) ClarkDietrich.
- 3) Metal-Lite.
- 4) Perfect Wall, Inc.
- 5) The Steel Network, Inc.
- 6) Telling Industries.

D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. CEMCO; California Expanded Metal Products Co.
- b. ClarkDietrich.
- c. Fire Trak Corp.
- d. Metal-Lite.
- e. Perfect Wall, Inc.
- f. The Steel Network, Inc.

2. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

3. Minimum Base-Metal Thickness: As indicated on Drawings but not less than 0.0329 inch.

E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0179 inch.
2. Depth: As indicated on Drawings.

G. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

H. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: 3/4 inch.
2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-

NON-STRUCTURAL METAL FRAMING

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diameter wire, or double strand of 0.048-inch-diameter wire.

2.03 AUXILIARY MATERIALS

- A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Foam Gasket Isolation Strip at Exterior Walls: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.02 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: As indicated on Drawings but not less than required by horizontal deflection performance requirements unless otherwise indicated.
 - 2. Multilayer Application: As indicated on Drawings but not less than required by horizontal deflection performance requirements unless otherwise indicated.
 - 3. Tile Backing Panels: As indicated on Drawings but not less than required by horizontal deflection performance requirements unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 6. Direct Furring: Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION

SECTION 09 29 00
GYP SUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Interior gypsum board.
 - 2. Impact resistant gypsum board.
 - 3. Mold-resistant gypsum board.
 - 4. Tile backing panels.
- B. Related Sections include:
 - 1. Division 06 Section "Sheathing" for gypsum sheathing for exterior walls.
 - 2. Division 09 Section "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
 - 3. Division 09 Section "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile at showers.
 - 4. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For trim accessories, full-size Sample in 12-inch-long length for each trim accessory indicated.
- C. Include Environmental Product Declaration for Green Globes Certification.

1.03 QUALITY ASSURANCE

- A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

GYP SUM BOARD

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1.04 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.05 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, 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.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.02 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. American Gypsum.
 - 2. CertainTeed Corporation.
 - 3. Georgia-Pacific Building Products.
 - 4. National Gypsum Company.
 - 5. United States Gypsum Company.

2.03 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch.
 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- B. Impact-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.
1. Core: 5/8 inch, Type X.
 2. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
 3. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
 4. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
 5. Hard-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements according to test in Annex A1.
 6. Long Edges: Tapered.
 7. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- C. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
1. Core: As indicated.
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- D. Sound Reducing Gypsum Board
1. Core: 5/8" inch
 2. STC Rated Assemblies: per ASTM E90: 48-60
 3. Fire rated Per ASTM E 119, UL263: 1 hour, Type X
 4. Flame Spread per ASTM E84 Class A
 5. Long Edges: Tapered

2.04 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. American Gypsum.
 - b. CertainTeed Corporation.
 - c. Georgia-Pacific Building Products.
 - d. National Gypsum Company.
 2. Core: 5/8 inch, Type X.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.05 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.

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- b. LC-Bead: J-shaped; exposed long flange receives joint compound.
- c. L-Bead: L-shaped; exposed long flange receives joint compound.
- d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
- e. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Fry Reglet Corporation.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.06 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape for Interior Gypsum Board: Paper
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
- D. Joint Compound for Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.07 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Resilient Metal Channels: As indicated on Drawings.
- C. 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 assembly.
- D. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."
- E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

- I. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.03 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: Vertical surfaces unless otherwise indicated and horizontal surfaces as indicated on Drawings.
 - 2. Impact-Resistant Type: Vertical and/or ceiling surfaces indicated on Drawings.
 - 3. Mold-Resistant Type: As indicated on Drawings
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.04 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.05 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

- B. Control Joints: Install control joints at locations indicated on Drawings or if not indicated according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. LC-Bead: Use at exposed panel edges.
 - 3. L-Bead: Use where indicated.
 - 4. U-Bead: Use where indicated.
- D. Aluminum Trim: Install in locations indicated on Drawings.

3.06 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Division 09 Section "Interior Painting."
- E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.07 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 30 13

CERAMIC TILING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Ceramic mosaic tile.
 - 1. Aluminum thresholds.
 - 2. Tile backing panels.
 - 3. Waterproof membrane.
 - 4. Crack isolation membrane.
 - 5. Metal edge strips.
- B. Related Sections include:
 - 1. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 2. Division 09 Section "Gypsum Board" for glass-mat, water-resistant backer board.
 - 3. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes

1.02 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.03 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Samples:
 - 1. 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.
- C. Include Environmental Product Declaration for Green Globes Certification.

1.05 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.06 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of each type of floor tile installation.
 - 2. Build mockup of each type of wall tile installation.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.08 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
 - 2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
 - 1. Waterproof membrane.
 - 2. Crack isolation membrane.
 - 3. Metal edge strips.

2.02 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation 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.

2.03 TILE PRODUCTS

- A. Ceramic Tile Types: Refer to Interior Finish Schedule for selections.

2.04 THRESHOLDS

- A. General: 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 above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Aluminum Thresholds: Refer to Interior Finish Schedule for selections.

2.05 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. C-Cure.
 - b. Custom Building Products.
 - c. FinPan, Inc.
 - d. Georgia-Pacific Building Products.
 - e. United States Gypsum Company.
 - 2. Thickness: 1/2 inch.
- B. Glass-Mat, Water-Resistant Backing Board: As specified in Division 09 Section "Gypsum Board."

2.06 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Ardex Engineered Cements.
 - b. Custom Building Products.
 - c. Laticrete International, Inc.
 - d. MAPEI Corporation.
 - e. Merkrete by Parex USA, Inc.
 - f. Texas Cement Products, Inc.

2.07 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and fabric reinforcement.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. Merkrete by Parex USA, Inc.
 - e. Southern Grouts & Mortars, Inc.

2.08 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
 - 1. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185/A 185M and ASTM A 82/A 82M, except for minimum wire size.
 - 2. Latex Additive: Manufacturer's standard acrylic resin or 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.
- B. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. ARDEX Americas.
 - b. C-Cure.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. Merkrete by Parex USA, Inc.
 - g. Southern Grouts & Mortars, Inc.
 - h. Texas Cement Products, Inc.
 - 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.09 GROUT MATERIALS

- A. High-Performance Tile Grout: ANSI A118.7.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. ARDEX Americas.
 - b. C-Cure.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. Southern Grouts & Mortars, Inc.
 - g. Texas Cement Products, Inc.
 - 2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
- B. Water-Cleanable Epoxy Grout: ANSI A118.3.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Atlas Minerals & Chemicals, Inc.
 - b. C-Cure.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. Merkrete by Parex USA, Inc.
 - g. Texas Cement Products, Inc.

2.10 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 7 Section "Joint Sealants."

2.11 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-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 A 666, 300 Series exposed-edge material.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Blanke Corporation.
 - b. Ceramic Tool Company, Inc.
 - c. Schluter Systems L.P.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.12 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

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.03 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - b. Tile floors consisting of tiles 8 by 8 inches or larger.
 - c. 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 manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with joint widths recommended by tile manufacturer.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Expansion Joints: Provide expansion joints and other 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.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them or apply strip of crack suppression membrane over joints in concrete substrate according to tile manufacturer's recommendations and adjust exposed joint location as required and as approved by Architect.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 - 1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thinset).
 - 2. Do not extend waterproofing or crack isolation membrane under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on waterproofing with elastomeric sealant.
- K. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

3.04 TILE BACKING PANEL INSTALLATION

- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.05 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

- B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.06 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
- B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.07 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.08 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.09 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Ceramic Tile Installation for Typical Installations: TCNA F113; thinset mortar.
 - a. Ceramic Tile Type: As indicated on Drawings.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: High-performance sanded grout or unsanded grout as appropriate for joint width indicated.

2. Ceramic Tile Installation at Showers: TCNA F121 and ANSI A108.1C; cement mortar bed (thickset) on waterproof membrane.
 - a. Ceramic Tile Type: As indicated on Drawings.
 - b. Bond Coat for Cured-Bed Method: Modified dry-set mortar.
 - c. Grout: Water-cleanable epoxy grout.
 3. Ceramic Tile Installation: TCNA F125-Partial; thinset mortar on crack isolation membrane.
 - a. Ceramic Tile Type: As scheduled over expansion and control joints in concrete substrates at concrete slabs on grade.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: Match adjacent grout materials.
 4. Floor Joints: Movement joint design in thinset floors and perimeter joints; TCA EJ171.
- B. Interior Wall Installations, Metal Studs or Furring:
1. Ceramic Tile Installation for Typical Installations: TCNA W245 or TCNA W248; thinset mortar on glass-mat, water-resistant gypsum backer board.
 - a. Ceramic Tile Type: As indicated on Drawings.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: Water-cleanable epoxy grout.
- C. Shower Wall Installations, Metal Studs or Furring:
1. Ceramic Tile Installation: TCNA B412; thinset mortar on cementitious backer units.
 - a. Ceramic Tile Type: As indicated on Drawings.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: Water-cleanable epoxy grout.

END OF SECTION

SECTION 09 51 13
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.
- C. Related Section 01 81 13.53 - Sustainable Design Requirements – Green Globes

1.02 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For components with factory applied finishes.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
 - 1. Acoustical Panels: Set of 6-inch-square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.
 - 3. Clips: Full-size impact clips and seismic clips.
- D. Delegated-Design Submittal: For seismic restraints for ceiling systems.
 - 1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Include Environmental Product Declaration for Green Globes Certification.

1.04 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Ceiling suspension-system members.
 - 2. Structural members to which suspension systems will be attached.

3. Method of attaching hangers to building structure.
4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
5. Size and location of initial access modules for acoustical panels.
6. Items penetrating finished ceiling and ceiling-mounted items including the following:
 - a. Lighting fixtures.
 - b. Diffusers.
 - c. Grilles.
 - d. Speakers.
 - e. Sprinklers.
 - f. Access panels.
 - g. Perimeter moldings.
7. Minimum Drawing Scale: 1/8 inch = 1 foot.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.06 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
 3. Impact Clips: Equal to 2 percent of quantity installed.

1.07 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. For each type of product, build mockup of typical ceiling area as shown on Drawings.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.09 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, 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.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for ceiling systems.
- B. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions for Seismic Design Category C determined according to ASCE/SEI 7.
- C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class A according to ASTM E 1264.
 - 2. Smoke-Developed Index: 450 or less.

2.03 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

2.04 ACOUSTICAL PANELS, CLG-3

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries Inc. Optima Tegalur or a comparable product approved by the Architect.
- B. Classification: Provide panels as follows:
 - 1. Type and Form: Type III, mineral base with painted finish; Form 1, nodular.
 - 2. Pattern: E I K.
- C. Color: White.
- D. Light Reflectance (LR): Not less than 0.85.
- E. Noise Reduction Coefficient (NRC): Not less than 0.75.
- F. Edge/Joint Detail: 9/16 inch square edge.
- G. Thickness: 7/8 inch.

ACOUSTICAL PANEL CEILINGS

09 51 13-3

Phase I: 100% Construction Documents

- H. Modular Size: 24 by 48 inches.
- I. Antimicrobial Treatment: Manufacturer's standard broad spectrum, 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, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.05 ACOUSTICAL PANELS, CLG-4

- J. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries Inc. Optima Tegular or a comparable product approved by the Architect.
- K. Classification: Provide panels as follows:
 - 1. Type and Form: Type III, mineral base with painted finish; Form 1, nodular.
 - 2. Pattern: E I K.
- L. Color: White.
- M. Light Reflectance (LR): Not less than 0.85.
- N. Noise Reduction Coefficient (NRC): Not less than 0.75.
- O. Edge/Joint Detail: 9/16 inch square edge.
- P. Thickness: 7/8 inch.
- Q. Modular Size: 24 by 24 inches.
- R. Antimicrobial Treatment: Manufacturer's standard broad spectrum, 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, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.06 METAL SUSPENSION SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corporation.
 - 3. Chicago Metallic Corporation.
 - 4. United States Gypsum Company.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.
 - 1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C 635/C 635M.

ACOUSTICAL PANEL CEILINGS

09 51 13-4

Phase I: 100% Construction Documents

- C. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 9/16-inch-wide metal caps on flanges.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries SUPRAFINE or a comparable product approved by the Architect.
 2. Structural Classification: Intermediate-duty system.
 3. End Condition of Cross Runners: Override (stepped) or butt-edge type.
 4. Cap Material: Steel cold-rolled sheet.
 5. Cap Finish: As selected by Architect.

2.07 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488/E 488M or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion or Postinstalled bonded anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B 633, Class SC 1 (mild) service condition.
 - c. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316.
 - d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.
 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Hold-Down Clips: Manufacturer's standard hold-down.

- F. Impact Clips: Manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
- G. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.
- H. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- I. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- J. Impact Clips: Manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.08 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corporation.
 - 3. Chicago Metallic Corporation.
 - 4. Fry Reglet Corporation.
 - 5. Gordon, Inc.
 - 6. United States Gypsum Company.
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and 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.
- C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's 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.
 - 1. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
 - 2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.10 ACOUSTICAL SEALANT

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- A. Acoustical Sealant: As specified in Division 07 Section "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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 unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.03 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C 636/C 636M, seismic design requirements, and manufacturer's written instructions.
- 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 only where required 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 spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 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.
 - 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 roof deck. Attach hangers to structural members.
 8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. 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 o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. 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 precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 3. 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, impact, and seismic clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.

3.04 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.05 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.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired

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to permanently eliminate evidence of damage.

END OF SECTION

ACOUSTICAL PANEL CEILINGS

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SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes; resilient tile flooring and transition trim.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM F1700

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Product Data: Submit data describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Samples:
 - 1. Submit manufacturer's complete set of color samples for initial selection.
 - 2. Submit two samples of each color.
- D. Include Environmental Product Declaration for Green Globes Certification.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.

- B. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- C. Store materials for not less than 48 hours prior to installation in area of installation at temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.8 EXTRA MATERIALS

- A. Section 01 70 00 - Execution Requirements: Spare parts and maintenance products. Furnish 200 sq ft of flooring, of each type and color specified.

PART 2 PRODUCTS

2.1 TILE FLOORING, Basis of Design product: TAJ Flooring Rift or approved equal

- A. Luxury Vinyl Tile, Classification, ASTM F1700:
 - 1. Size: 7" x 48".
 - 2. Overall Gauge Thickness: 5 mm
 - 3. Installation: Glue Down
 - 4. Tile Pattern: Random Staggered
 - 5. Wear Layer: 20 mil
 - 6. Color: Honey at Physicians Lounge and Russet at Executive Offices
 - 7. Install Pattern: As planks in one direction, one color per unit.
- B. Other Acceptable Manufacturers to match above specification.

2.2 ACCESSORIES

- A. Subfloor Filler: Cementitious or Premix latex as recommended by adhesive material manufacturer.
- B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
- C. Carpet to VCT transition: Johnsonite CTA-XX-A at all transitions. - Color to be selected.
- D. VCT to Rubber Tile: Johnsonite VT1-XX - Color to be selected.
- E. Ceramic Tile to VCT: Johnsonite CTA-XX-K at all transitions. Color to be selected.
- F. VCT Reducer: Johnsonite RRS-XX-C at VCT to concrete transitions. Color to be selected.
- G. Filler for Coved Base: Plastic.
- H. Sealer and Wax: types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify concrete floors are dry to maximum moisture content as recommended by manufacturer, and exhibit negative alkalinity, carbonization, and dusting. Verify floor and lower wall surfaces are free of substances capable of impairing adhesion of new adhesive and finish materials.

3.2 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- B. Prohibit traffic until filler is cured.
- C. Clean substrate.
- D. Apply primer as required to prevent "bleed-thru" or interference with adhesion by substances cannot be removed.

3.3 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed.
- B. Lay flooring with joints and seams as illustrated in drawings.
- C. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- D. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated. Secure metal strips before installation of flooring with stainless steel screws.
- F. Install flooring in recessed floor access covers. Maintain floor pattern.
- G. At movable partitions, install flooring under partitions without interrupting floor pattern.
- H. Install feature strips and floor markings where indicated. Fit joints tightly.

3.4 CLEANING

- A. Section 01 70 00 - Execution Requirements: Final cleaning.
- B. Remove excess adhesive from floor, base, and wall surfaces without damage.
- C. Clean, seal, and maintain resilient flooring products.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution Requirements: Protecting installed construction.
- B. Prohibit traffic on resilient flooring for 48 hours after installation.

3.6 SCHEDULE

- 1. See Drawings and Specification Section 09 00 00 Color.

END OF SECTION

SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Resilient base.
 - 2. Resilient molding accessories.
- B. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.
- C. Include Environmental Product Declaration for Green Globes Certification.

1.03 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.01 THERMOSET-RUBBER BASE (TYPICAL INSTALLATIONS)

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Burke Mercer Flooring Products; a division of Burke Industries Inc.
 - 2. Flexco.
 - 3. Roppe Corporation, USA.

- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 - 1. Style: Style B, cove.
- C. Thickness: 0.125 inch.
- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Preformed.
- H. Colors: As indicated by manufacturer's designations or if not indicated as selected by Architect from full range of industry colors Insert colors.

2.02 LUXURY VINYL CONTOURED BASE (WHERE INDICATED ON DRAWINGS)

- A. Basis of Design: Design is based on products manufactured by Johnsonite, Inc.; a Tarkett company. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Burke Mercer Flooring Products; a division of Burke Industries Inc.
 - 3. Flexco.
- B. Resilient Base Standard: ASTM F 1861, Type TV (vinyl, thermoplastic).
 - 1. Material Requirement: Type TP (vinyl, thermoplastic).
 - 2. Manufacturing Method: Group I (solid, homogeneous).
- C. Minimum Thickness: 0.25 inch.
- D. Height: As indicated on drawings
- E. Profile: As selected by Architect from manufacturer's full range.
- F. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.
- G. Outside Corners: Job formed or preformed.
- H. Inside Corners: Job formed or preformed.
- I. Finish and Color: As selected by Architect from manufacturer's full range.

2.03 RESILIENT MOLDING ACCESSORY

- A. Resilient Molding Accessory:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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- a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - b. Flexco, Inc.
 - c. Johnsonite.
 - d. R.C.A. Rubber Company (The).
 - e. Roppe Corporation, USA.
 - f. VPI, LLC; Floor Products Division.
- B. Description: Nosing for resilient floor covering, reducer strip for resilient floor covering, and joiner for tile.
- C. Material: Vinyl.
- D. Profile and Dimensions: As indicated.
- E. Locations: Provide resilient molding accessories in areas indicated.
- F. Colors and Patterns: As selected by Architect from full range of industry colors.

2.04 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Accessories: Prepare according to ASTM F 710.
- 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
 - 4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are same temperature as the space where they are to be installed.
- 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

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- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.02 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.

3.03 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.04 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION

SECTION 09 66 00

STATIC CONTROL FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Static control (Conductive and Static dissipative) resilient vinyl floor tile.

1.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-in-Place Concrete: Finishes for concrete substrates.
- B. Section 06 11 40 – Wood Blocking and Curbing: Wood floor substrate.
- C. Section 09 65 00 - Resilient Flooring: Resilient wall base.
- D. Section 09 65 00 – Accessories.
- E. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes

1.3 REFERENCES

- A. ASTM D 2240 - Standard Test Method for Rubber Property-Durometer Hardness; 2000.
- B. ASTM D 3389 - Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform, Double-Head Abrader); 1994 (Reapproved 1999).
- C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2000a.
- D. ASTM E 162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source; 1998.
- E. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2000.
- F. ASTM F 970 - Standard Test Method for Static Load Limit; 2000.
- G. ASTM F 1700 - Standard Specification for Solid Vinyl Floor Tile; 1999.
- H. ASTM F 1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 1998.
- I. ASTM F 2170 – 02 -Determining Relative Humidity in Concrete Floor Slabs Using in-situ Probes
- J. ESD S.7.1-2005 Floor Materials -- Resistive Characterization of Materials; Electrostatic Discharge Association; 2001.
- K. FTM 101B, Method 4046.1 - Test Procedures for Packaging Materials; Electrostatic Properties of Materials; Revision C, 1980, incl. Change Notice 3, 1988.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 30 00.

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- B. [Product Data](#) : Submit manufacturer's literature for all products furnished, including appropriate Material Safety Data Sheets (MSDS) and specimen warranties.
- C. Selection Samples: Submit two sets of samples or color charts showing all available colors.
- D. Verification Samples: Submit two samples of each type and color or pattern that will be installed.
- E. Manufacturer's Installation Instruction: Submit written instructions describing examination, preparation and installation procedures, [Installation Instructions](#)
- F. Maintenance Instructions: Submit maintenance manual including procedures and recommended floor care products for stain removal, surface repair and cleaning.
- G. Warranty: Submit executed copy of warranty.
- H. Include Environmental Product Declaration for Green Globes Certification.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company trained by manufacturer or supervised by company trained by manufacturer specializing in applying the work of this section with a minimum of five years experience.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to job site in sealed, undamaged containers with labels intact and legible, indicating the material name, date of manufacture and lot number.
- B. Store materials in a dry secure area, where temperatures and other requirements are in accordance with manufacturer's recommendations.
- C. Keep products away from open flames.

1.7 PROJECT CONDITIONS

- A. Install materials in accordance with all safety procedures required by manufacturer and applicable rules and regulations of local, state and federal authorities having jurisdiction.
- B. Environmental requirements:
 - 1. Do not install flooring when temperature is below 65 degrees F (59 degrees C).
 - 2. Maintain temperature at or above the minimum allowed in accordance with manufacturer's recommendations.
 - 3. Ventilate area where flooring is being installed.
- C. During installation period, provide uniform lighting at area of installation equivalent to finished project lighting.
- D. Prevent traffic from entering area where flooring is being installed or is curing.

1.8 MAINTENANCE

- A. Review manufacturer's maintenance instructions with building management. Never wax materials specified herein without written recommendation with approved products from manufacturer.

1.9 WARRANTY

- A. Tile: Provide manufacturer's standard warranty for installed flooring, for period of 10 years

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from date of purchase for materials and for the lifetime of the installed ESD floor for electrical properties from the date of testing and certification by authorized representative of flooring manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Product shall be manufactured in The United States of America
- B. Acceptable Manufacturer: Staticworx Inc. 4706 Waterbury Stowe Rd., Waterbury, VT, 05677

Tel: 1-617-923-2000 Fax: 1-617-467-5871 or Equal Products are acceptable.

Email: info@staticworx.com Web: www.staticworx.com

a. MATERIALS

- i. Conductive Floor Tile: Ameriworx Series ESD Floor Tile; solid vinyl tile made with at least 10% percent pre-consumer recycled content; complying with ASTM F 1700, not requiring waxing to achieve a gloss finish or to maintain electrical properties, and with the following characteristics:
 - 1. Squareness Tolerance: Plus/minus 0.005 inches, in accordance with ASTM F 540.
 - 2. Hardness: Plus/minus 55, Shore D, when tested in accordance with ASTM D 2240.
 - 3. Abrasion Resistance: < 1.0 grams loss, maximum, when tested in accordance with ASTM D 3389.
 - 4. Static Load Resistance: When tested in accordance with ASTM F 970:
 - a. At 125 pounds (57 kg) load, 0.25 inch (6 mm) diameter indenter foot, for 24 hours (equivalent of 2,500 psi (17 MPa) point load): Residual indentation 24 hours after removing load not more than 3 percent of tile thickness.
 - b. At 700 pounds (317 kg) load, 1.125 inch (31 mm) diameter indenter foot, for 24 hours (equivalent of 700 psi (5 MPa) point load): Residual indentation 24 hours after removing load not more than 1 percent of tile thickness.
 - 5. Flame Spread Index: Not more than 25 (Class 1), when tested in accordance with ASTM E84 or ASTM E 162.
 - 6. Smoke Developed Index: Not more than 450 (Class 1), when tested in accordance with ASTM E 84.
 - 7. Critical Radiant Flux: 1.1 W per sq cm, minimum, when tested in accordance with ASTM E 648 or NFPA 253.
 - 8. Conductive Tile Performance:
 - a. Electrical Resistance, Surface To Ground: 25,000 to 1,000,000 (2.5 x 10⁴ to 1 x 10⁶) ohms, when tested in accordance with ESD S.7.1.
 - b. Static Decay: Less than 0.3 seconds, from 5000 volts to 0 volts, when tested in accordance with FTM 101B, Method 4046.1.
 - c. Static Generation: Less than 25 volts with conductive footwear at 20 percent relative humidity.
 - 9. Static-Dissipative Tile Performance:
 - a. Electrical Resistance, Surface To Ground: 1,000,000 to 1,000,000,000 (1 x 10⁶ to 1 x 10⁹) ohms, when tested in accordance with ESD S.7.1.
 - b. Static Decay: Less than 0.1 seconds, from 5000 volts to 0 volts, when tested in accordance with FTM 101B, Method 4046.1.
 - c. Static Generation: Less than 50 volts with conductive footwear at 20 percent relative humidity.
 - 10. Color: As selected by Architect from manufacturer's full range.
 - 11. Thickness: 0.125 inch (3.2 mm).

12. Size(s): As indicated on drawings.
 13. Size: 12 by 12 inches (305 by 305 mm).
 14. Size: 24 by 24 inches (610 by 610 mm). Special Order Only
 15. Size: 36 by 36 inches (915 by 915 mm). Special Order Only
- ii. Tile Adhesive: Conductive adhesive as recommended by flooring manufacturer.
- b. ACCESSORY MATERIALS
- i. Grounding Strips: Copper foil, of type recommended by flooring manufacturer; provide minimum of 1 strip 2" X 24" per 1000 square feet (93 sq m) and minimum of 3 in a single room.
 - ii. Subfloor Filler: Latex modified, cementitious materials with compressive strength greater than concrete subfloor.
 - iii. Subfloor Joint Sealer: Flexibilized epoxy or equivalent.
 - iv. Cleaning agents: As recommended by flooring manufacturer.
 - v. Concrete Substrate Moisture Test Kit: Calcium chloride type kit, as required to conduct ASTM F 1869 tests; as recommended by flooring manufacturer.
 - vi. Concrete Substrate Relative humidity Test: Relative Humidity Meter as required to conduct ASTM F 2170 – 02 -Determining Relative Humidity in Concrete Floor Slabs using in-situ Probes
 - vii. Megohmmeter capable of measuring resistive properties $> 25,000$ ohms and $\leq 1.0 \times 10^{10}$ ohms per ANSI/ESD S7.1-2005

C. EXECUTION

a. EXAMINATION

- i. Verify that subfloors:
 1. Meet flooring manufacturer's requirements.
 2. Are ready to receive work.
 3. Are compatible with the flooring.
 4. Are clean, dry, and free of substances that would affect bond.
 5. Are free from dropping, projections, ridges or other surface defect that would adversely affect installation, performance or appearance.
- ii. Do not begin work until concrete substrate has cured 28 days minimum, and measured moisture vapor transmission rate (MVTR) is not greater than 3 pounds (1.4 kg) per 1000 square feet (93 sq m) per 24 hours, when tested in accordance with ASTM F 1869 using calcium chloride test kits.
- iii. Verify that curing agents used for concrete are compatible with flooring and adhesives.
- iv. Verify flatness tolerances. Do not install flooring on subfloors not meeting requirements of flooring manufacturer. Notify Architect of unsatisfactory conditions.
- v. Beginning of installation means acceptance of existing substrates.

b. PREPARATION

- i. Prepare surfaces for flooring installation in accordance with manufacturer's instructions and warranty conditions.
- ii. Repair substrate and surface to flatness tolerances meeting flooring manufacturer's requirements.
- iii. Clean and abrade surfaces by shot blast or equivalent abrasive method producing a residue free sub-floor.

c. INSTALLATION

- i. Install in accordance with manufacturer's instructions and warranty conditions and to meet specified performance requirements.
- ii. Install wall base in accordance with manufacturer's instructions.
- iii. Finish floor to smooth level surface to tolerances specified by manufacturer.
- iv. Slope to drains.

d. PROTECTION

- i. Protect finished flooring from damage until Substantial Completion.

END OF SECTION

SECTION 09 68 13
TILE CARPETING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes modular carpet tile.
- B. Related Sections include Division 09 Section "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.
- C. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes

PREINSTALLATION MEETINGS

- D. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- E. Include Environmental Product Declaration for Green Globes Certification.

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1.03 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.04 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.05 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

1.06 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockups at locations and in sizes as directed by Architect.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."

1.08 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

- D. Where items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.09 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.
 - f. Delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 CARPET TILE, FF-2A, FF-2B

- A. Basis of Design: Design is based on Interface carpet tile. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Patcraft
 - 2. Milliken & Company.
 - 3. Mohawk Group (The); Mohawk Carpet, LLC.
 - 4. Tandus; a Tarkett company.
- B. Color and Pattern: As indicated in Interior Finish Schedule.

2.02 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.
- C. 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.

PART 3 - EXECUTION

TILE CARPETING

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3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Perform moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: 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 adhesive and carpet tile manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.03 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.
- E. Cut and fit carpet tile 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 tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.

3.04 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 09 72 19
FELT WALLCOVERING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This Section includes requirements for felt fabric acoustical wallcovering adhered to substrate.

1.2 SUBMITTALS

- A. Submit manufacturer's product data, including complete laboratory test results, representative details, and other information necessary to establish that product is appropriate for application.
- B. Submit 4 inch x 6 inch sample of felt fabric acoustical wall covering.
- C. Submit shop drawings indicating full extent of felt fabric acoustical wall covering. Include elevations indicating extent of felt fabric acoustical wall covering and seaming pattern.
- D. Submit installer qualifications including photographs of complete projects and references.

1.3 QUALITY ASSURANCE

- A. Manufacturer shall have a minimum of five (5) years experience in providing felt similar in size, scope, and complexity to the work of this project
- B. Installer shall have a minimum of five (5) years experience in the installation of natural materials such as leather, cork, or felt similar in size, scope, and complexity to the work of this project.

1.4 MOCK-UP

- A. If installer holds less than five (5) years experience with felt wall covering, construct a mockup at the project site of a typical wall with felt fabric acoustical wall covering. Mock-up shall be a minimum of 10 feet x 10 feet and will be reviewed for seam quality, color range, and workmanship. Mock-up shall contain a typical opening, reveals, and other special conditions.
- B. Obtain Architect's acceptance of the mock-up before starting remainder of work. Retain mock-up during construction as a standard for judging completed work. Do not alter mock-up after acceptance. Mock-up may be incorporated into the work upon approval by the Architect.

1.5 PRE-INSTALLATION CONFERENCE

- A. Approximately two weeks prior to scheduled commencement of installation and associated work, meet at project site to discuss conformance with requirements of specification and job site conditions. Representatives of the architect, general contractor, installer, and other parties who are involved in the scope of this installation shall attend the meeting. Review submittals, specific concerns related to site conditions, installation methods, and other work governing the quality of the installation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials from excessive moisture in shipment, storage, and handling. Material shall be inspected upon arrival for flaws or defects. Felt fabric acoustical wall covering that is flawed shall be rejected. Do not store felt fabric acoustical wall covering in bolts in an upright position or beneath other materials. Felt material must acclimate in the space to be installed a minimum of 48 hours.

1.7 PROJECT CONDITIONS

- A. Schedule installation of felt fabric acoustical wall covering as late as possible in sequence of construction schedule to reduce damage.
- B. Space shall be enclosed and weather tight, with temperature and humidity stable at values near those indicated for final occupancy

PART 2 - GENERAL

2.1 MANUFACTURER

- A. Basis-of-Design Manufacturer: FilzFelt, 425 CrossPoint Parkway, Getzville, NY 14068. Tel 800.482.7777, 716.446.2380. Fax 716.446.2396. info@filzfelt.com, www.filzfelt.com.
- B. Equal products of other manufacturer's are acceptable upon strict compliance with the requirements of this Section and approval by the Architect.

2.2 FELT WALLCOVERING

A. AWP-1, AWP-3

- 1. Model: Akustika 10 Wall
- 2. Color: 573 KUPFER, 175 GRAPHIT

B. AWP-2

- 1. Model: ARO Plank 1
- 2. Color: 150 WEIB

C. AWP-4

- 1. Model: Rain
- 2. Color: 100 WOLLWEIB/150 WEIB

D. Properties:

- a. NRC (ASTM C423): 0.10.
- b. SAA (ASTM C423): 0.10.
- c. ASTM E 84: Class A.
- d. CAL 117: Complies.
- e. CAN/ULC S102-10: FS Rating 20, SD Classification 155.
- f. EN 13501-1 (Euroclass): B-s1-d0 (flame treated), D-s1-d0 (untreated).
- g. FAR 25.853(a): Pass (60 second vertical burn), Pass (12 second vertical burn).
- h. Fire Protection Code for Interior Material (China): B1.
- i. GB/T 5455: B1 (flame treated).

FELT WALLCOVERING

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- j. ISO 5660.1-2002: Group 3.
- k. NFPA 260: Class 1.
- l. NFPA 701: Pass (flame treated).
- m. Colorfastness to Light Class: 4–5 (40 hours).
- n. Colorfastness to Crocking: Class 3–4 (wet), Class 4–5 (dry).
- o. ASTM 4966 (Martindale Abrasion Tester Method): 5,000 Grade 4, 10,000 Grade 3.5, 20,000 Grade 3.5, 40,000 Grade 3.
- p. ASTM D 5034 (Grab Test): 243 lb (avg of warp), 214 lb (avg of weft).
- q. Environmental: Oeko-Tex Standard 100 Certified Product Class II (100% Wool Design Felt), Meets VOC test limits for the CDPH v1.2 method (100% Wool Design Felt).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrate and spaces in which work is to be performed.
- B. Do not begin installation until:
 - 1. Space has been enclosed and is weather-tight.
 - 2. Wet work has been completed and is dry.
 - 3. Painting is completed and wall base and floor covering is installed.
 - 4. Adjacent work of other trades such as woodwork, ceilings, wall coverings, reveals, and other contiguous work has been completed.
- C. Drywall surfaces shall be taped, bedded, sanded, and primed. Penetrations shall be sealed against air and moisture leakage through wall.
- D. Do not proceed with installation until unsatisfactory conditions have been corrected. Beginning of installation indicates acceptance of existing substrate conditions.

3.2 INSTALLATION

- A. Install felt fabric acoustical wall covering in strict accordance with manufacturer instruction and recommendations.
 - 1. Inspect for surface irregularities and plan the cutting and piece selection to ensure that the “best side” will be visible. Wool felt is a natural material and minor changes and slight inclusions of natural fiber on the surface are evidence of 100% natural origin of the material. Allow felt to acclimate to the installation environment. After the shipping crates have been opened, the felt should be laid out individually on the floor for at least 48 hours. Variations in temperature and humidity may affect the size. ^[1]_{SEP}
 - 2. Prepare the substrate to provide a smooth and even surface Level 5. Finish surface and prime.
 - 3. Trim the felt as needed to provide plumb and straight edges.
 - 4. Using a foam roller, coat the substrate with suitable adhesive. Allow to cure per the adhesive manufacturer's application instructions.
 - 5. Apply the felt to the surface and use a weighted roller to smooth the surface, working from one end to remove any air bubbles. Rolling the entire surface also ensures maximum bond of the adhesive.

3.3 CLEANING AND PROTECTING

- A. Clean exposed surfaces of felt fabric acoustical wall covering.

- B. Remove surplus materials, rubbish and debris, leaving area in a neat and clean condition.
- C. Cover felt fabric acoustical wall covering installation with new, clean vinyl sheeting.

END OF SECTION

SECTION 09 91 23

INTERIOR PAINTING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Steel and iron.
 - 3. Galvanized metal.
 - 4. Gypsum board and glass-fiber-reinforced gypsum fabrications.
- B. Related sections include:
 - 1. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes

1.02 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
 - 3. Include Environmental Product Declaration and Green Label Certificates for Green Globes Certification
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and in each color and gloss of

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topcoat.

1. Submit Samples on rigid backing, 8 inches square.
 2. Apply coats on Samples in steps to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.04 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.05 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
 - b. Other Items: Architect will designate items or areas required.
 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 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 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.07 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5

INTERIOR PAINTING

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deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Behr Process Corporation.
 - 2. Benjamin Moore & Co.
 - 3. Pratt & Lambert.
 - 4. Sherwin-Williams Company (The).

2.02 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As indicated in a color schedule or if not indicated as selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

INTERIOR PAINTING

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3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. 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.
- E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
- F. 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.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.03 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. 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.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - 2. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Other items as directed by Architect.
 - 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.04 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: 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.

3.05 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:

- 1. Latex System MPI INT 3.1A:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior (MPI Gloss Level 2 or 3), MPI #44 or MPI #52.

- B. Steel Substrates: Typical steel substrates.

- 1. Latex System, Alkyd Primer MPI INT 5.1QQ:
 - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.

- C. Steel Substrates: Surfaces of steel doors and frames.

- 1. Water-Based Light Industrial Coating System MPI INT 5.1B:
 - a. Prime Coat: Primer, rust-inhibitive, water based MPI #107.
 - b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, interior, water based, semi-gloss (MPI Gloss Level 5), MPI #153.

- D. Steel Substrates: Surfaces of structure overhead.

- 1. Water-Based Dry-Fall System MPI INT 5.1C:
 - a. Prime Coat: Primer, alkyd, quick dry, for metal, MPI #76.
 - b. Topcoat: Dry fall, latex, flat, MPI #118.

- E. Galvanized-Steel Substrates: Typical for galvanized steel doors and frames.

- 1. Water-Based Light Industrial Coating System MPI INT 5.3K:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, interior, water based, semi-gloss (MPI Gloss Level 5), MPI #153.

- F. Galvanized-Steel Substrates: Galvanized surfaces of steel roof deck.

- 1. Water-Based Dry-Fall System MPI INT 5.3H:
 - a. Prime Coat: Dry fall, water based, for galvanized steel, matching topcoat.

- b. Topcoat: Dry fall, water based, for galvanized steel, flat (MPI Gloss Level 1), MPI #133.

G. Gypsum Board Substrates: Typical wall surfaces.

- 1. Latex over Latex Sealer System MPI INT 9.2A:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior (MPI Gloss Level 4), MPI #43.

H. Gypsum Board Substrates: Typical ceiling surfaces.

- 1. Latex over Latex Sealer System MPI INT 9.2A:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

I. Gypsum Board Substrates: Walls at toilets and service areas.

- 1. Latex over Latex Sealer System MPI INT 9.2A:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.

END OF SECTION

SECTION 09 97 24
PENETRATING LIQUID FLOOR TREATMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes penetrating liquid floor treatment applied to cured concrete where "Sealed Concrete" finish is indicated.
- B. Section 01 81 13.53 - Sustainable Design Requirements – Green Globes

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Include Environmental Product Declaration for Green Globes Certification.

1.03 QUALITY ASSURANCE

- A. Source Limitations: Obtain penetrating liquid floor treatment materials through one source from a single manufacturer.

PART 2 - PRODUCTS

2.01 FLOOR AND SLAB TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.
 - 1. Products: Subject to compliance with requirements, provide one of the following products:
 - a. Burke by Edoco; Titan Hard.
 - b. Curecrete Distribution Inc.; Ashford Formula.
 - c. Dayton Superior Corporation; Day-Chem Sure Hard.
 - d. Euclid Chemical Company (The); Euco Diamond Hard.
 - e. Meadows, W. R., Inc.; Liqui-Hard.
 - f. Symons Corporation, a Dayton Superior Company; Buff Hard.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content of surfaces exceeds that permitted in manufacturer's written instructions.

3.02 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 - 1. Apply to concrete that is fully cured; do not apply to concrete that is less than 28 days' old.
 - 2. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

3.03 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. Protect work of other trades against damage from floor treatment application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

END OF SECTION

SECTION 10 14 23

PANEL SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Exterior panel signs.
 - 2. Room-identification panel signs.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For panel signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.03 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.04 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.05 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the Texas Accessibility Standards" (TAS) for signs.

2.02 SIGNS

- A. Exterior Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Product: As selected by Architect under specified allowance.
 - 2. Solid-Sheet Sign: Aluminum sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph below and as follows:
 - a. Surface-Applied Graphics: Applied paint.
 - 3. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Square cut.
 - b. Corner Condition in Elevation: Rounded to radius indicated.
 - 4. Mounting: Manufacturer's standard method for substrates indicated with.
 - 5. Surface Finish and Applied Graphics:
 - a. Painted Finish and Graphics: Manufacturer's standard, factory-applied exterior-grade sign paint, in color.
- B. Interior Room-Identification Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles.
 - 1. Product: Basis of design shall be by ASI, model "InTouch ADA ready". Size shall be 7"x7" and made of acrylic. Face of sign shall be photopolymer matte finish with acrylic backing. Sign shall be mounted to walls mechanically. Color selections by Architect.

2.03 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish nonferrous-metal or stainless-steel devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - 4. Sign Mounting Fasteners:
 - a. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.
- B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with

PANEL SIGNAGE

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sign surfaces free of distortion and other defects in appearance. Install signs so they do not protrude or obstruct according to the accessibility standard.

2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
1. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
 2. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
- C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION

SECTION 10 21 13.15
STAINLESS STEEL TOILET
COMPARTMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Toilet compartments configured as toilet enclosures and urinal screens.
- B. Related Sections include:
 - 1. Division 10 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
- B. Shop Drawings: For toilet compartments.
 - 1. Include plans, elevations, sections, details, and attachment details.
 - 2. Show locations of cutouts for compartment-mounted toilet accessories.
 - 3. Show locations of centerlines of toilet fixtures.
 - 4. Show locations of floor drains.
 - 5. Show overhead support or bracing locations.
- C. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
 - 1) Size: 2 by 2 inch (52 by 52 mm) minimum, in type of finish specified.
- D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.03 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of toilet compartment.

1.04 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the TDLR "2012 Texas Accessibility Standards" (TAS) for toilet compartments designated as accessible.

2.02 STAINLESS STEEL TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Accurate Partitions Corp.; ASI Group.
 - 2. Ampco Products, LLC.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation.
 - 5. Columbia Lockers; Partition Systems International of South Carolina.
 - 6. Marlite.
 - 7. Metpar Corp.
 - 8. Tex-Lam Manufacturing, Inc.
- B. Privacy Style Partitions: No sightlines with gap-free interlocking doors and stiles routed 0.300 inches (7.6 mm) from the edge to allow 0.175 inch (4.4 mm) overlap to prevent line-of-sight into the toilet compartment. Privacy strips fastened or adhered onto the partition material are not acceptable.
- C. Toilet-Enclosure Style: Overhead braced.
- D. Urinal-Screen Style: Wall hung.

- b. Door, Panel, and Pilaster Construction, General: Form edges with interlock to provide watertight fit without crown molding. Braze corners and finish smooth.
 - 1) Provide exposed surfaces free of pitting, visible seams and fabrication marks, stains, telegraphing of core material, or other imperfections.
 - 2) Core Material: Manufacturer's standard sound-deadening, water resistant honeycomb in thickness required to provide finished thickness for doors, panels and pilasters.
- c. Door Construction: 1 inch (25 mm) thick, constructed from 0.0313 inch/22 ga (0.794 mm) stainless steel.
 - 1) Provide each door with internal 0.0625 inch/16 ga (1.59 mm) and 0.0781 inch/14 ga (1.98 mm) welded reinforcements at top and bottom hinge locations, with factory installed concealed true gravity cam hinges.
 - 2) Provide pre-punched hole to permit field installation of ADA-compliant concealed slide latch.
- d. Panel Construction: 1 inch (25 mm) thick, constructed from 0.0313 inch/22 ga (0.794 mm) stainless steel.
 - 1) Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.
- e. Pilaster Construction: 1 1/4 inch (32 mm) thick, constructed from [0.0375 inch/20 gauge (0.953 mm)] [0.048 inch/18 gauge (1.219 mm)] stainless steel.
 - 1) Provide pilaster with internally welded bracket suitable to accept minimum 3 inch (76 mm) long, 5/16 inch (7.9 mm) stainless steel hex bolt for leveling.
- f. Headrail: Extruded anodized aluminum headrail with anti-grip profile. Provide fasteners for attachment to pilaster and stainless steel brackets to secure to wall.
- g. Shoes: 4 inches (102 mm) high minimum, Type 304 stainless steel with No. 4 satin brushed finish. Secured to the floor with tamper-resistant screws.
- h. Urinal-Screen Construction: Matching toilet compartment panel construction
- i. Urinal-Screen Post: Manufacturer's standard post design of [material matching the thickness and construction of pilasters] [or] [1-3/4-inch- (44-mm-) square] aluminum tube with satin finish]; with shoe[and sleeve (cap)] matching pilaster.
- j. Brackets (Fittings):
 - 1) Stirrup Type: Ear or U-brackets; [chrome-plated zamac] [stainless steel].
 - 2) Full-Height (Continuous) Type: Manufacturer's standard design; [aluminum] [stainless steel].

2.03 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.

STAINLESS STEEL TOILET COMPARTMENTS

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1. Hinges: Manufacturer's minimum 0.062-inch-thick stainless-steel paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door. Mount with through-bolts.
 2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
 3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
 4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
 5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.04 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless-Steel Castings: ASTM A 743/A 743M.

2.05 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide in-swinging doors for standard toilet compartments and 36-inch-wide out-swinging doors with a minimum 32-inch-wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
 - 2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
 - 3. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.03 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-

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swinging doors to return doors to fully closed position.

END OF SECTION

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes corner guards.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of wall and door protection showing locations and extent.
- C. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:
 - 1. Corner Guards: 12 inches long.

1.03 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
 - 2. Keep plastic materials out of direct sunlight.
 - 3. Store plastic wall-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
 - a. Store corner-guard covers in a vertical position.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain wall-protection products of each type from single source from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.

2.03 CORNER GUARDS

- A. Basis of Design: Design is based on Pawling Corporation Pro-Tek Model No. CG-50 Stainless steel corner guard. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Boston Retail Products.
 2. Construction Specialties, Inc.
 3. Inpro Corporation.
 4. Korogard Wall Protection Systems; a division of RJF International Corporation.
 5. Nystrom, Inc.
- B. Surface-Mounted, Opaque-Plastic Corner Guards: Fabricated as one piece from acrylic-modified vinyl sheet; with formed edges; fabricated with 90- or 135-degree turn to match wall condition.
1. Wing Size: Nominal 1-1/2 by 1-1/2 inches.
 2. Mounting: Adhesive.
 3. Color and Texture: As selected by Architect from manufacturer's full range.
- C. Surface-Mounted, Metal Corner Guards: Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
1. Material: Stainless-steel sheet, Type 304.
 - a. Thickness: Minimum 0.0625 inch.
 - b. Finish: Bright annealed.
 2. Wing Size: Nominal 1-1/2 by 1-1/2 inches.
 3. Corner Radius: 1/8 inch.
 4. Mounting: Adhesive.

2.04 MATERIALS

- A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.
- B. Polycarbonate Plastic Sheet: ASTM D 6098, S-PC01, Class 1 or Class 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft.-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
- C. Adhesive: Low VOC adhesive, as recommended by protection product manufacturer.

WALL AND DOOR PROTECTION

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2.05 FABRICATION

- A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

2.06 FINISHES

- A. Protect 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.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine walls to which wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For wall protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.03 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings.

3.04 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by

WALL AND DOOR PROTECTION

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manufacturer.

END OF SECTION

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Public-use washroom accessories.
 - 2. Public-use shower room accessories.
 - 3. Childcare accessories.
 - 4. Custodial accessories.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.
- B. Samples: Full size, for each exposed product and for each finish specified.

1.03 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.04 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.05 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Design for washroom accessories, shower room accessories, childcare accessories, and custodial accessories is based on products indicated on Drawings.

Subject to compliance with requirements, provide named product or comparable product approved by Architect by one of the following:

1. American Specialties, Inc.
2. Bobrick Washroom Equipment, Inc
3. Bradley Corporation.

2.02 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with applicable provisions in the "Texas Accessibility Standards" (TAS) for toilet accessory products and installation.

2.03 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- E. 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.
- F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.04 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.01 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, when tested according to ASTM F 446.

3.02 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION

SECTION 10 44 10

SPECIALTY SIGNS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cut/ Fabricated metal graphics.

1.03 REFERENCES

- A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable By Physically Handicapped People.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Shop Drawings: Indicate sign styles, lettering font, foreground and background colors, locations, overall dimensions of each sign.
- C. Samples: Submit sample signs illustrating type, style, letter font, and colors specified; method of attachment.
- D. Manufacturer's Installation Instructions: Include installation template and attachment devices.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code and ANSI A117.1 for requirements for the physically handicapped.
- B. All sign to meet code requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.
- B. Package signs, labeled in name groups.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not install signs when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 Manufacturers

- A. Manufacturers of cut graphics, and cast plaque:

ARK Ramos
Andco Industries Corp.

ASI Sign Systems
Best Manufacturing Co.

SPECIALTY SIGNS

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**SISD – Support and Technology Building
El Paso, Texas**

Apco Graphics
Architectura Graphics

Vomar Products Inc.

2.02 CUT GRAPHICS

- A. Signs:
 - 1. Logo Color: Aluminum in Satin finish.
 - 2. Letter Color: Aluminum in Satin finish.
 - 4. Total Thickness: 1/16 inch.
 - 5. Height: varies with location . Refer to drawings.
 - 6. Length: Varies with location. Refer to drawings
 - 7. Edges: Painted edge.
- B. Materials:
 - 1. Precision Cut Aluminum letters and UMC logo
 - 2. Standard polyurethane color finish to be selected.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions. All signs and graphics are to be mechanically fastened.
- B. Install signs after surfaces are finished, in locations indicated on the drawings.
- C. Position sign to meet requirements of TAS standards and as indicated on the drawings.

3.03 SCHEDULES

- A. Provide cast plaque where indicated on the drawings.

END OF SECTION

SPECIALTY SIGNS

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SECTION 10 44 13
FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes fire-protection cabinets for portable fire extinguishers.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For fire-protection cabinets.

1.03 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.04 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.05 SEQUENCING

- A. Apply decals on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.01 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Basis of Design: Design is based on Larsens Manufacturing Company Architectural Series Model 2409-R3. Subject to compliance with requirements, provide named product or comparable product approved by Architect by one of the following:
 - a. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - b. Nystrom, Inc.
 - c. Potter Roemer LLC.
- B. Cabinet Construction: Rated and nonrated where applicable.
- C. Cabinet Material: Cold-rolled steel sheet.

- D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - 1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
- E. Cabinet Trim Material: Steel sheet.
- F. Door Material: Steel sheet.
- G. Door Style: Vertical duo panel with frame.
- H. Door Glazing: Tempered float glass (clear).
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
- J. Accessories:
 - 1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated or if not indicated as directed by Architect.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Decals.
 - 3) Orientation: Vertical.
- K. Materials:
 - 1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish:
 - 1) Cabinet: Baked enamel or powder coat.
 - 2) Frame and Door: Factory primed for field painting.
 - 2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.02 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Prepare recesses for semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

- B. Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
- D. Identification: Apply decals at locations indicated.
- E. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

END OF SECTION

SECTION 10 44 16

FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.03 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.04 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.05 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.06 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.02 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - b. Larsens Manufacturing Company.
 - c. Potter Roemer LLC.
 - 2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.03 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - b. Larsens Manufacturing Company.
 - c. Nystrom, Inc.
 - d. Potter Roemer LLC.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.

- B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION

SECTION 12 24 13
ROLLER WINDOW SHADES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Manual roller shades.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
- C. Samples: For each exposed product and for each color and texture specified.

1.03 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.02 MANUAL ROLLER SHADES

- A. Basis of Design: Design is based on products scheduled on Drawings manufactured by MechoShade Systems, Inc. Subject to compliance with requirements, provide named product or comparable product approved by Architect by one of the following:
 - 1. Draper Inc.
 - 2. Hunter Douglas Contract.
 - 3. Lutron Electronics Co., Inc.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of

shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
 2. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers that are operated by one roller drive-end assembly.
- E. Shadebands:
1. Shadeband Material: Light-filtering fabric & blackout fabric.
 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
- F. Installation Accessories:
1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
 - a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 4 inches.
 - b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
 2. Installation Accessories Color and Finish: As selected from manufacturer's full range.
 3. Fascia:
 - a. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
 - b. Fascia shall be able to be installed across two or more shade bands in one piece.
 - c. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
 - d. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
 - e. Notching of Fascia for manual chain shall not be acceptable.
 4. Room Darkening Side and / or Sill Channels:
 - a. Extruded aluminum with polybond edge seals and SnapLoc-mounting brackets and with concealed fastening. Exposed fastening is not acceptable. Channels shall accept one-piece exposed blackout hembar with vinyl seal to assure side light control and sill light control.
 5. MechoShade side channels, 1-15/16 inches (49.2 mm) wide by 1-3/16 inches (30.1 mm) deep, two-band center channels, 2-5/8 inches (66.6 mm) wide by 1-3/16 inches (30.1 mm) deep. The 2-5/8-inch (66.6 mm) double-center channels may be installed at center-support positions of multi-band-shade ElectroShades. MechoShade side channels 2-5/8 inch (66.6 mm) may be used as center supports for ElectroShades; shadebands up to 8 high. For shadebands over 8 feet (2438 mm), provide ElectroShade side channels.
 6. Color: As selected from manufacturer's full range.

2.03 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: MechoShades "Soho," single thickness non-raveling 0.0358- inch thick tpo fabric, in colors selected from manufacturer's available range. Solar shadecloth containing fiberglass is not acceptable.
 - 1. Dense Basket Weave: "1900 series", 5 percent open, 2 by 2 dense basket-weave pattern.
 - 2. Color: 1905 Dove Grey
 - 3. Orientation on Shadeband: Up the bolt.
- C. Black out Fabric: Chelsea Blackout 0250 Series
 - 1. Color: 0260 Silver

2.04 ROLLER SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F.
- C. Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
- D. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:
 - 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
- E. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams, including welded ends, and concealed hem weights. Provide hem weights of appropriate size and weight for shade band. Provide continuous hem weight inside sealed hem pocket.
- F. Shade band and Shade Roller Attachment:
 - 1. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch in diameter for manual shades, and less than 2.55 inches for motorize shades are not acceptable.
 - 2. Provide for positive mechanical engagement with drive / brake mechanism.
 - 3. Provide for positive mechanical attachment of shade band to roller tube; provide removable / replaceable with a "snap-on" snap-off" spline mounting shade band, without having to remove shade roller from shade brackets.
 - 4. Do not use adhesives, adhesive tapes, staples, and/or rivets on mounting spline.
- G. Shade Fabrication:

1. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.
2. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shade cloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design. Fabricate hem as follows:
 - a. Bottom hem weights.
 - b. Concealed hem tube.
 - c. Exposed hem tube.
3. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shade cloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.
4. For railroaded shade bands, provide seams in railroaded multi-width shade bands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shade bands.
5. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shade bands.
6. Blackout shade bands, when used in side channels, shall have horizontally mounted, roll formed stainless steel or tempered-steel battens not more than 3 feet (115 mm) on center extending fully into the side channels. Battens shall be concealed in a integrally-colored fabric to match the inside and outside colors of the shade band, in accordance with manufacturer's published standards for spacing and requirements.
 - a. Battens shall be roll formed of stainless steel or tempered steel and concave to match the contour of the roller tube.
 - b. Batten pockets shall be self-colored fabric front and back RF welded into the shade cloth. A self-color opaque liner shall be provided front and back to eliminate any see through of the batten pocket that shall not exceed 1-1/2 inches (38.1 mm) high and be totally opaque. A see-through moiré effect, which occurs with multiple layers of transparent fabrics, shall not be acceptable.
7. Roller Shade Schedule:
 - a. Ref. Architectural Drawings for schedule.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, locations of connections to building electrical system, and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
- B. Electrical Connections: Connect motor-operated roller shades to building electrical system and lighting control system.
- C. Roller Shade Locations: At exterior windows as indicated on Drawings.

3.03 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.04 CLEANING AND PROTECTION

- A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.05 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION

SECTION 12 36 60
QUARTZ SURFACE COUNTERTOPS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quartz surfacing countertops.
- B. Adhesives and sealants.

1.2 RELATED REQUIREMENTS

- A. Section 01 31 00 – Project Management and Coordination: Submittals.
- B. Section 01 77 00 - Closeout Procedures.
- D. Section 06 41 00 – Wood Blocking.
- E. Division 22 - Plumbing Sections.

1.3 REFERENCES

- A. Reference Standards: NA

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 31 00 – Project Management and Coordination: Submittals.
- B. Product Data:
 - 1. Submit product data for each specified product. Include manufacturer's technical data sheets and published instruction instructions.
 - 2. Submit Material Safety Data Sheets (MSDS) for adhesives and sealants.
- C. Shop Drawings:
 - 1. Submit fully dimensioned shop drawings showing countertop, layouts, joinery, terminating conditions, substrate construction, cutouts, and holes. Show plumbing installation provisions. Include elevations, section details, and large-scale details.
- D. Samples:
 - 1. Submit selection and verification samples for each color, pattern, and finish required.
- E. Quality Assurance Submittals:
- F. Maintenance Data: Submit manufacturer's published maintenance manual with closeout submittals.

1.5 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with the U.S. Architectural & Transportation Barriers Compliance Board ADA-ABA Accessibility Guidelines for Buildings and Facilities.

QUARTZ SURFACE COUNTERTOPS

12 36 60 - 1

Phase I: 100% Construction Documents

- B. Adhesives, Sealants, and Sealant Primers: 1. SCAQMD (South Coast Air Quality Management District) Rule 1168.
- C. Comply with TDLR requirements.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Fabricator Qualifications: Minimum of three years documented experience in fabricating quartz surfacing countertops similar in scope and complexity to this Project. Currently certified by the manufacturer as an acceptable fabricator.
 - 2. Installer Qualifications: Minimum of three years documented installation experience for projects similar in scope and complexity to this Project, and currently certified by the manufacturer as an acceptable installer. Installer shall be the fabricator.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver all material protected and packaged.
- B. Storage and Protection: Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer. Store sheet materials flat on pallets or similar rack-type storage to preclude damage.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual measurements and openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.
- B. Adhesive: Acclimatize adhesives to occupancy room temperatures with maximum temperature not to exceed 75 deg F.

1.9 WARRANTY

- A. Manufacturer's Limited Warranty: Provide manufacturer's standard 10 Year Commercial Limited Warranty against defects in quartz surface sheet materials.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: Wilsonart LLC. Full Contact Information: Wilsonart LLC, 2400 Wilson Place, Temple, TX 76503- 6110. Tel. 254.207.7000, Toll-Free 800.433.3222, Fax 254.207.2384. Websites are: www.wilsonart.com (primary website <http://sustain.wilsonart.com> (sustainable design website))

2.2 QUARTZ SURFACE SHEET MATERIAL

- A. Acceptable Product: "Wilsonart Quartz" Surface or equal.
- B. Material Thickness: 1/2 inch, nominal.
- D. Physical Characteristics: As per Wilson Art material.
- E. Color, Pattern, and Finish Design: Refer to Interior Finish Schedule

QUARTZ SURFACE COUNTERTOPS

12 36 60 - 2

Phase I: 100% Construction Documents

2.3 ACCESSORY MATERIALS

- A. Joint Adhesive: as per manufacturer's recommendation for this type of material
 - 1. Product: "Wilsonart Quartz Surface Adhesive."
- B. Elastomeric Sealant: Mildew-resistant silicone sealant for filling gaps between countertops and terminating substrates in wet environment applications. Complies with ASTM C 920, Type S (single component), Grade NS (non-sag).
 - 1. Product: Acceptable to countertop manufacturer.
 - 2. Color: Complementary to quartz surfacing color.
- C. Siliconized Acrylic Sealant: Siliconized acrylic latex sealant. For general applications to fill gaps between countertops and at terminating substrates. Complies with ASTM C 834, Type OP, Grade NF, and SCAQMD Rule 1168.
 - 1. Product: "Wilsonart Color Matched Caulk".
 - 2. Color: Complementary to quartz surfacing color.
- D. Construction Adhesive: Countertop manufacturer's recommended silicone-based construction adhesive for back splashes, end splashes, and other applications according to manufacturer's published fabrication instructions.

2.4 FABRICATION

- A. Fabricate components in shop, to greatest extent practicable, in sizes and shapes indicated according to approved shop drawings and Wilsonart published fabrication requirements.
- B. Form joint seams between quartz surfacing components with specified seam adhesive. Completed joints inconspicuous in appearance and without voids. Provide joint reinforced if required by manufacturer for particular installation conditions.
- C. Provide holes and cutouts indicated on approved shop drawings. Rout cutouts and complete by sanding all edges smooth.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions that could adversely affect the work of this Section.
- B. Substrates must be sound, flat, smooth, and free from dust or other surface contaminants.
- C. Commencement of work will constitute acceptance of substrates and conditions to receive the work.

3.2 COUNTERTOP INSTALLATION

- A. Install quartz surfacing components plumb, level, and true according to approved shop drawings and manufacturer's published installation instructions. Use woodworking and specialized fabrication tools acceptable to manufacturer.
- B. Form joint seams with specified seam adhesive. Seams to be inconspicuous in completed work. Seams in locations shown on approved shop drawings and acceptable to manufacturer. Promptly remove excess adhesive.

- C. Provide minimum 1/2 inch radius for countertop inside corners.
- D. Fill gaps between countertop and terminating substrates with specified silicone sealant.
- E. If applicable rout sink cutouts to manufacturer's template. Adhere quartz surface cast sink units to countertops with specified adhesive.
- F. Install backsplashes and end splashes where indicated on Drawings. Adhere to countertops with specified construction adhesive.

3.3 REPAIRS

- A. If permissible to Architect, minor surface marring for quartz surfacing components may be repaired according to manufacturer's published installation instructions.
- B. Remove and replace quartz surfacing components that are damaged and cannot be satisfactorily repaired.

3.4 CLEANING AND PROTECTION

- A. Clean quartz surfacing components according to manufacturer's published maintenance instructions. Completely remove excess adhesives and sealants from finished surfaces.
- B. Protect completed work from damage during remainder of construction period.

3.5 SCHEDULE

- A. See drawings.

END OF SECTION

SECTION 12 36 60.10
SOLID SURFACE COUNTERTOPS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Solid surfacing countertops.
- B. Adhesives and sealants.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 - Submittals.
- B. Section 01 7000 - Closeout Submittals.
- C. Section 05 5000 - Metal Fabrications.
- D. Section 06 4100 – Wood Blocking.
- E. Division 15 - Plumbing Sections.

1.03 REFERENCES

- A. Reference Standards: NA

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 3000 - Submittals.
- B. Product Data:
 - 1. Submit product data for each specified product. Include manufacturer's technical data sheets and published instruction instructions.
 - 2. Submit Material Safety Data Sheets (MSDS) for adhesives and sealants.
- C. Shop Drawings:
 - 1. Submit fully dimensioned shop drawings showing countertop, layouts, joinery, terminating conditions, substrate construction, cutouts, and holes. Show plumbing installation provisions. Include elevations, section details, and large-scale details.
- D. Samples:
 - 1. Submit selection and verification samples for each color, pattern, and finish required.
- E. Quality Assurance Submittals:
- F. Maintenance Data: Submit manufacturer's published maintenance manual with closeout submittals.

1.05 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with the U.S. Architectural & Transportation Barriers Compliance Board ADA-ABA Accessibility Guidelines for Buildings and Facilities.

B. Adhesives, Sealants, and Sealant Primers: 1. SCAQMD (South Coast Air Quality Management District) Rule 1168.

C. Comply with TDLR requirements.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Fabricator Qualifications: Minimum of three years documented experience in fabricating solid surfacing countertops similar in scope and complexity to this Project. Currently certified by the manufacturer as an acceptable fabricator.

2. Installer Qualifications: Minimum of three years documented installation experience for projects similar in scope and complexity to this Project, and currently certified by the manufacturer as an acceptable installer. Installer shall be the fabricator.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver all material protected and packaged.

B. Storage and Protection: Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer. Store sheet materials flat on pallets or similar rack-type storage to preclude damage.

1.08 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements and openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

B. Adhesive: Acclimatize adhesives to occupancy room temperatures with maximum temperature not to exceed 75 deg F.

1.09 WARRANTY

A. Manufacturer's Limited Warranty: Provide manufacturer's standard 10 Year Commercial Limited Warranty against defects in solid surface sheet materials.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Basis of Design: Wilsonart LLC. EDITING NOTE: Full Contact Information: Wilsonart LLC, 2400 Wilson Place, Temple, TX 76503- 6110. Tel. 254.207.7000, Toll-Free 800.433.3222, Fax 254.207.2384. Websites are: www.wilsonart.com (primary website) <http://sustain.wilsonart.com> (sustainable design website) EDITING NOTE: Revise mock-up size and location to suit Project requirements.

2.02 SOLID SURFACE SHEET MATERIAL

A. Acceptable Product: "Wilsonart Solid Surface."

B. Composition: Acrylic resins, fire-retardant mineral fillers, and proprietary coloring agents. Through-the-body color for full thickness of sheet material.

C. Material Thickness: 1/2 inch, nominal.

D. Physical Characteristics: As per Wilson Art Surface" material.

E. Color, Pattern, and Finish Design: To be selected by architect.

2.03 ACCESSORY MATERIALS

A. Joint Adhesive: Methacrylate-based adhesive for chemically bonding solid surfacing seams. Color complementary to solid surfacing sheet material. UL 2818 GREENGUARD Gold certified and complies with SCAQMD Rule 1168.

1. Product: "Wilsonart Hard Surface Adhesive."

B. Elastomeric Sealant: Mildew-resistant silicone sealant for filling gaps between countertops and terminating substrates in wet environment applications. Complies with ASTM C 920, Type S (single component), Grade NS (non-sag).

1. Product: Acceptable to countertop manufacturer.

2. Color: Complementary to solid surfacing color.

C. Siliconized Acrylic Sealant: Siliconized acrylic latex sealant. For general applications to fill gaps between countertops and at terminating substrates. Complies with ASTM C 834, Type OP, Grade NF, and SCAQMD Rule 1168.

1. Product: "Wilsonart Color Matched Caulk".

2. Color: Complementary to solid surfacing color.

D. Construction Adhesive: Countertop manufacturer's recommended silicone-based construction adhesive for backsplashes, end splashes, and other applications according to manufacturer's published fabrication instructions.

2.05 FABRICATION

A. Fabricate components in shop, to greatest extent practicable, in sizes and shapes indicated according to approved shop drawings and Wilsonart published fabrication requirements.

B. Form joint seams between solid surfacing components with specified seam adhesive. Completed joints inconspicuous in appearance and without voids. Provide joint reinforced if required by manufacturer for particular installation conditions.

C. Provide holes and cutouts indicated on approved shop drawings. Rout cutouts and complete by sanding all edges smooth.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions that could adversely affect the work of this Section.

B. Substrates must be sound, flat, smooth, and free from dust or other surface contaminants.

C. Commencement of work will constitute acceptance of substrates and conditions to receive the work.

3.02 COUNTERTOP INSTALLATION

A. Install solid surfacing components plumb, level, and true according to approved shop drawings and manufacturer's published installation instructions. Use woodworking and specialized fabrication tools acceptable to manufacturer.

- B. Form joint seams with specified seam adhesive. Seams to be inconspicuous in completed work. Seams in locations shown on approved shop drawings and acceptable to manufacturer. Promptly remove excess adhesive.
- C. Provide minimum 1/2-inch radius for countertop inside corners.
- D. Fill gaps between countertop and terminating substrates with specified silicone sealant.
- E. if applicable rout sink cutouts to manufacturer's template. Adhere solid surface cast sink units to countertops with specified adhesive.
- F. Install back splashes and end splashes where indicated on Drawings. Adhere to countertops with specified construction adhesive.

3.03 REPAIRS

- A. If permissible to Architect, minor surface marring for solid surfacing components may be repaired according to manufacturer's published installation instructions.
- B. Remove and replace solid surfacing components that are damaged and cannot be satisfactorily repaired.

3.05 CLEANING AND PROTECTION

- A. Clean solid surfacing components according to manufacturer's published maintenance instructions. Completely remove excess adhesives and sealants from finished surfaces.
- B. Protect completed work from damage during remainder of construction period.

3.06 SCHEDULE

- A. See drawings.

END OF SECTION

**SECTION 210000
FIRE SPRINKLER SYSTEM**

PART 1 GENERAL

1.1 DESCRIPTION

- A. Design, fabricate, install and secure all necessary approvals of a complete fire protection automatic sprinkler system in accordance with the standards set forth in this section.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. The following are described in the indicated other sections for these specifications. Perform all such work required in strict accordance with the provisions of those sections.

Plumbing
Electrical

1.3 CODES AND STANDARDS

- A. In addition to conforming with all pertinent codes and regulations, conform with the requirements of the American Insurance Association and NFPA Standard #13 - Standards for the Installation of Sprinkler Systems (latest edition) and NFPA #13A - Recommended Practice of the Care and Maintenance of Sprinkler System (latest edition) and the Through TTUHSC El Paso Fire Marshal, AHJ office.

1.4 QUALIFICATIONS AND SPRINKLER SYSTEM DESIGN

- A. The entire fire protection automatic sprinkler system shall be designed, fabricated, installed and tested by a Company regularly engaged in the design, installation and testing of Automatic Fire Protection Sprinkler Systems for a period of five years.
- B. Fire Sprinkler System design shall be performed by an Engineering Technician certified by the National Institute for Certification in Engineering Technologies (NICET) at a minimum of Level III.
- C. All fire sprinkler design shall be performed under the direct supervision of the installing companies Responsible Managing Employee (RME) registered in the state of Texas. All design shall be verified and acknowledged by original signature on all shop drawings. Rubber stamp signature will not be accepted.
- D. Unless otherwise noted on specifications, design shall conform to Light Hazard occupancies in Offices, Classrooms (other than art rooms and woodshop rooms),

Gymnasiums, and other areas designated by NFPA 13 as light hazard. Ordinary Hazard occupancies shall be utilized in janitor closets, storage areas, kitchens, art rooms, and other areas designated by NFPA as Ordinary Hazard. Balance of areas shall be in accordance with NFPA Classification of Occupancies.

- E. Design areas shall be a minimum of 1,500 square feet as described in NFPA. Area reductions for the use of quick response sprinklers will be considered.

1.5 SUBMITTALS

- A. Shop Drawings; Submit six (6) sets of the following shop drawings to the Engineer for approval. When approved, they will be forwarded to the Architect. All shop drawings, before being sent to the Engineer, must bear stamp of approval of the State Agency having jurisdiction over the project.

- B. The following items shall be incorporated on all Fire Sprinkler System design shop drawings as a minimum:

- . • Walls, ceilings, lights, and diffusers.
- . • Room names and room numbers
- . • Ceiling Elevations and obstruction depth and location.
- . • Riser Elevations detailing all valves, piping, switches, trims, and drains as required.
- . • Riser, water motor gong and Fire Department Connection Location.
- . • System limits and size.
- . • Site plan showing all fire hydrants, underground piping, flow test, and fire hydrant hose lay.
- . • All main, branchlines showing sizes, elevation and transitions.
- . • Piping center to center dimensions as a minimum. Cut lengths are allowed.
- . • Dimensions showing distances off of walls, head to head, etc.
- . • All types of sprinklers utilized with all information on sprinklers and quantity.
- . • Hanger and support locations spaced in accordance with NFPA 13.
- . • Hanger details, drain details, etc stating all equipment being used.
- . • Hydraulic information including all node points, remote areas, design information, base of the riser and point of connection demands.
- . • Structural layout and description of structural materials.
- . • All necessary cross sections detailing conflicting areas and pipe routing.
- . • Major duct locations and roof penetration drops.

- C. All drawing and calculations shall be submitted Through TTUHSC El Paso Fire Marshal, AHJ office. Any additional information required will be provided by the contractor at no additional cost to TTUHSC El Paso Fire Marshal, AHJ office.

- D. As-built drawings: During progress of the work of this section, maintain an accurate record of all changes made in the design of the fire sprinkler system.
- E. Upon completion of the installation, and as a condition of its acceptance, accurately transfer all as-built information to three (3) identical blue-line prints of the approved shop drawings. Insert one print into each copy of the manual described below.
- F. Manual: Upon completion of the installation, and a condition of its acceptance, compile the following manual and deliver three (3) copies to the Owner.
- G. Size: Approximately 8-1/2 inches by 11 inches.
- H. Format: Firmly bound in hard backed binder with clear plastic pocket on spine. "Looseleaf" binding is not acceptable.
- I. Contents:

Identification inserted in the spine of each binder shall be as follows: "FIRE SPRINKLER SYSTEM MANUAL".

Neatly typed index, at or near the front, with all emergency information location clearly identified.

A complete list of all components of the system with manufacturer's name, catalog numbers and all data required of ordering replacement parts.

One copy of the as-built drawings described above.

All information required to affect or secure emergency repairs or service.

1.6 PRODUCT HANDLING

- A. Use all means necessary to protect fire sprinkler system materials before, during and after installation and to protect the installed work of other trades. In the event of damage, immediately make all repairs and replacement necessary to the approval of, and at no additional cost to the Owner.

PART 2 PRODUCTS

- A. Not Used
- B. Not Used.
- C. Not Used
- D. Not Used

E. Not Used

F. Not Used

G. Not Used

H. Not Used

I. Not Used

J. Not Used

K. Not Used

L. Not Used

M. Hydrostatic test of the underground will perform for 2 hours with no leaks observed. All hubs will be exposed at that time for visual inspection. This inspection and test will be witnessed by an OWNER representative. 24-hour notice is required.

N. The contractor will be responsible for applying for the fire line tap. Contractor to provide the OWNER representative with a copy of the application. Fees will be paid for by OWNER.

O. Prior to system acceptance of the underground, all lines will be flushed in accordance to NFPA at a minimum of 20 feet per second to flush out all debris and impairments. Flushing will continue until the water is clear and free of debris. The installed backflow will be flushed and tested by an authorized backflow prevention technician licensed by the State of Texas. All testing documents will be provided in the Operation and Maintenance manuals at the end of the project. All tests documents to be signed and witnessed by an OWNER representative.

P. All piping that can be welded or grooved shall be Schedule 10, schedule 40, copper type L hard piping in accordance with Table 6.3.1.1 of NFPA 13 2002 Edition.

Q. All piping that is to be threaded shall be schedule 40 piping in accordance with Table 6.3.1.1 of NFPA 13 2002 Edition. Threadable thinwall will not be accepted.

R. All fittings, grooved, flanged, or threaded shall be in accordance with Table 6.4.1 of NFPA 13 2002 Edition.

S. All welding shall be performed in a shop in accordance to NFPA 13. Field welding is not acceptable.

T. All pipe fabrication shall be in accordance with NFPA. Welded outlets shall be free of any imperfections. Oval holes and partial cut holes obstructing flow will not be accepted. All mains and branchlines that are welded will be available for OWNER inspection.

U. All hangers to be installed in accordance to NFPA 13. Rod will be straight and plumb. All hangers to be listed for the use in fire sprinkler systems. Bent rod will be removed and replaced. Headers to be sized and installed in accordance with NFPA.

V. System size will not exceed 52,000 square feet per floor. Multiple risers on a manifold will be installed at the supply entrance to the building. Unless otherwise noted, all areas of the school shall be protected by the fire sprinkler systems.

W. Fire Department Connections shall be installed on the address side of the facility. Threads shall meet the requirements of the El Paso County Fire Department. Elevation shall be between 18" and 2'-6" of the finish grade.

X. The following shall be included on all risers:

- O.S.&Y gate valve with tamper switch
- Alarm valve with trim (riser checks are not acceptable)
- Water motor Gong
- Flow Switch
- Main drains and piping
 - Spare head box and required wrench of socket and adequate number of sprinklers per NFPA 13
- Identification signs for all valves.
- Hydraulic placard for all areas designed
- Emergency operation and shut down procedures posted and protected under glass.

Y. Install a 4-way sway brace at the top of each riser to prevent movement.

Z. All sprinklers installed in lay-in ceilings or gypboard ceilings to be recessed hidden type.

AA. All sprinklers in exposed areas to be brass upright type sprinklers.

AB. All sprinklers installed near kilns, kitchen hoods, or other equipment that produces heat, sprinklers shall be rated at 286 degrees.

AC. Sprinklers installed in refrigerators and freezers shall be dry pendent type sprinklers with chrome 2-piece escutcheons and head guards. Shaft shall be at least 16" long. Install upright sprinklers above freezers and coolers that have equipment above the ceiling.

- AD. Extended coverage sprinklers shall be permitted. Installation must be in accordance with manufacturer's recommendations and NFPA 13.
- AE. Inspectors test connections shall be installed at the furthest distance from the riser. Install a splash block at the exterior drain point to avoid eroding.
- AF. Install auxiliary drains where necessary. Route piping to nearest janitor's closet and sink. If routed to the exterior, install a splash block on the drain point to avoid eroding.
- AG. All sprinkler installations in ceilings to be plumb and level. Sprinklers are required to be installed in the center of the tile. Install sprinkler in a symmetrical pattern to be approved by Architect.
- AH. Install upright sprinklers at the top of the elevator hoistway. Provide an O.S.&Y gate valve and flow switch at the exterior of the shaft to monitor the sprinkler. Sprinkler head shall be 200 degrees.
- AI. Install an upright or pendent sprinkler in the elevator machine room. Provide and O.S.&Y gate valve and flow switch outside the room to monitor the sprinkler.
- AJ. Sprinklers are not required in the elevator pit. Pit to be enclosed, non combustible and equipment to be non combustible.
- AK. All fire sprinkler systems are required to be monitored. Fire Alarm contractor to provide space in the building for a fire alarm panel to all fire sprinkler flow switches and tamper switches. Fire Sprinkler contractor will provide the devices and the fire alarm contractor to route wire and tie into panel.
- AL. All systems are to be hydrostatically tested for 2 hours without any leaks. Test will be witnessed by an OWNER representative. 24-hour notice will be required.
- AM. Prior to system acceptance, all systems shall be flushed at a minimum of 20 feet per second to remove all debris and impairments per NFPA 13, 8.14.16. Flushing to be witnessed by an OWNER representative.

PART 3 EXECUTION

3.1 PRIOR TO INSTALLATION

- A. Prior to the commencement of each stage of the fire sprinkler system installation, carefully inspect the installed work of other trades and determine that all such work is sufficiently complete to allow this installation to begin and that the work of other trades has been installed in such a manner as to permit this installation to be made in complete accordance with the approved design.

3.2 COORDINATION

- A. Coordinate the installation schedule for this portion of the work with the overall construction schedule for the work to ensure orderly progress of the work with an absolute minimum of delay.
- B. Coordinate interface of fire sprinkler system with the work of all other trades to ensure proper and adequate provision of the installation and connection of this system.

3.3 EXCAVATION, TRENCHING AND BACKFILLING

- A. Perform all required excavating, trenching and backfilling for this portion of the work in strict accordance with the provision of these sections of these specifications.

3.4 INSTALLATION

- A. Install the complete fire sprinkler system in strict accordance with the approved shop drawings. Perform all piping installation in strict accordance with the provision of the Plumbing Section of these specifications, including the furnishing of all required sleeves for fire sprinkler system pipes passing through walls, floors, and other parts of the building and the furnishing and installing of all split wallplates and escutcheons for exploded fire sprinkler system pipes.
- B. Do not cut or make holes in any part of the building except where shown on the approved shop drawings.
- C. This Contractor shall be responsible for interconnection of fire sprinkler system with the fire detection and alarm system.
- D. Furnish and install next to the sprinkler riser main a printed sheet protected by glass or a transparent plastic cover, giving brief instructions regarding control, emergency procedure and other data as required by NFPA #13. For hydraulically designed sprinkler systems, a placard must be permanently attached to the rise indicating the location, and the basis of design, (discharge density and system demand).

3.5 TESTING AND ACCEPTANCE

- A. All tests below shall be witnessed by a representative from the Engineer's office. The Contractor shall inform the Engineer of the time and place to witness the tests a minimum of 24 hours in advance. Failure to notify the Engineer shall be cause for rejection and retest of the system.

- B. Prior to connecting to the overhead sprinkler piping, flush the underground main thoroughly. Secure all required approvals of the flushing operation.
- C. Upon completion of the fire sprinkler system installation, test and retest the complete installation and make all corrections as necessary to secure acceptance by any other authority having jurisdiction. Furnish all test equipment and personnel required.

3.6 INSTRUCTIONS

- A. Prior to the building opening date, instruct selected personnel in the operation of the sprinkler system. Take special care to ensure that these personnel will immediately recognize whether the main valve is in open or closed positions.
- B. Know how to drain the system.
- C. Know how to test alarm valve.
- D. Be familiar with the existence and contents of the manual described above.

3.7 SCHEDULE FOR COMPLETION

- A. Complete the Automatic Fire Sprinkler System ready for operation, in all respects, within the allotted time. When the system is complete and ready for continuous operation, activate the system for its intended use. After the system has been activated for continuous use, water changes, if any, will be paid by Owner.
- B. Fire Protection systems including fire hydrants, backflow preventors, etc shall be tested and inspected prior to the occupancy of the facility (substantial completion).
- C. Upon OWNER acceptance of the facility, the contractor shall perform both quarterly and annual inspections for the first year warranty period. The owner shall take over all inspection and maintenance after the first year is complete (from final acceptance).
- D. All documentation will be provided to OWNER of all inspections performed and a written report of deficiencies found and corrected prior to relieving the contractor of obligations.

END OF SECTION 210000

**SECTION 220000
PLUMBING**

PART 1- GENERAL

1.1 CONTENTS

- A. This section of the specifications contains items applicable only to the Plumbing Section. Section 220500, Mechanical General Conditions, contains items which also apply. This section of the specifications supplements some of the statements therein so as to apply to the plumbing system.

1.2 SCOPE OF WORK

- A. It is the intent of these specifications and drawings to furnish a plumbing system, inside and outside of the building, complete, fully adjusted and ready to use. All work and material must conform to all State and Local Plumbing Codes in every respect.
- B. Failure to install a piping system properly shall be cause for rejection and replacement of piping system.
- C. All piping systems shall be installed as indicated on the contract documents. Should the Contractor want to vary from the installation shown on the contract documents, detailed drawings of all proposed modifications must be submitted to the Engineer for approval prior to ordering materials or commencing with work.

PART 2 - MATERIALS

2.1 PIPE AND FITTINGS IN GENERAL

- A. All metal pipe is to be straight, free from dents, scars or burrs with ends reamed, cut smooth, and as further specified for the individual applications. All changes in pipe sizes in cast iron soil pipe shall be made with reducing fittings. Wye fittings with 1/8 or 1/16 bends or combination wye and 1/8 bend fittings shall be used where changes in direction occur.

2.2 SEWER PIPE

- A. All sewer pipe shall be of the best quality standard weight cast iron. Pipe fittings shall be coated inside and out with varnish. See Section 220500 for backfill requirements.
- B. At the Contractor's option, schedule 40 polyvinyl chloride (PVC) solid core sewer pipe may be used underground only; SDR 35 is not permitted. See Section 220500 for backfill requirements.

2.3 INSTALLATION OF CAST IRON PIPE AND FITTINGS

- A. Cast iron pipe and fittings shall be installed in accordance with manufacturer's instructions and shall be run in the most direct manner.
- B. Horizontal pipes shall have a grade of one quarter inch (1/4") per foot, wherever possible, and not less in any case than one eighth inch (1/8") per foot unless noted on the contract documents.
- C. Provide depression under bell of each joint where hub and spigot pipe is used to maintain even bearing of sewer pipe.

2.4 INSTALLATION OF PVC PIPE AND FITTINGS

- A. Materials shall be installed in accordance with ASTM D-2321 and shall be run in the most direct manner.
- B. Pipe grading shall be as noted above with continuous support from a firm base of 4 to 6 inches bedding depth of material and compaction meeting ASTM-2321.
- C. Provide depression under each joint to maintain even bearing of sewer pipe. Support of piping with materials other than bedding is forbidden.
- D. Trench width at the top of the pipe shall be a minimum of 18 inches or diameter of pipe plus one foot, whichever is greater and a maximum of the outside diameter of the pipe plus two feet.
- E. Initial backfill shall be 12 inches above top of pipe with material specified in ASTM D-2321.

2.5 JOINTS IN SOIL PIPE

- A. Joints in hub and spigot piping shall be Ty-seal or equal neoprene gaskets meeting CISPI 310 and ASTM C 564.
- B. Joints in no-hub cast iron pipe shall be made with a one piece neoprene gasket and 4-band stainless steel clamp meeting CISPI 310 and ASTM C564.
- C. Joints between cast iron and PVC shall be made with standard gasket and clamp described above. Install couplings in strict accordance with Manufacturer's instructions.

2.6 CLEANOUTS

- A. Provide where shown on drawings and required by Code, all necessary cleanouts. Equipment by Zurn, Wade, J.R. Smith and Josam shall be considered equal providing they meet the recommendations listed.
- B. Floor cleanouts: cleanouts in finished areas shall be Zurn, ZN-1400-NH with round scoriated nickel bronze top.

- C. Outdoor Cleanouts: Cleanouts in traffic areas shall be Zurn, ZN-1402-NH, with heavy duty grate and straight threaded tapered shoulder plug that seals against caulk lead seat.
- D. Wall cleanouts: Wall cleanouts shall be Zurn, Z-1468, with stainless steel access cover.
- E. Locations: Cleanouts shall be installed at the base of each soil stack, 90 degree turns and where shown on the drawings. The distance between cleanouts in horizontal runs of piping shall not exceed 50 ft. intervals. Install all cleanouts where shown on the drawings and where required by the Local Plumbing Code. Cleanouts shall be full size according to the size in which they are installed up to and including four inch (4").

2.8 INTERIOR DOMESTIC WATER PIPING SYSTEMS

- A. All domestic hot and cold water lines including evaporative cooler supply and drain lines within the building above ground shall be type "L" hard drawn copper pipe with sweat soldered wrought copper fittings and 95/5 lead free solder. All piping below grade shall be type "K" copper with silver solder joints unless otherwise indicated, but no joints shall be made below grade. Provide dielectric unions wherever copper and ferrous metals are joined. Dielectric separation using brass unions or valves shall not be considered an acceptable method of separation.

2.9 EXTERIOR DOMESTIC WATER LINES

- A. The site domestic water line shall be C-900 plastic pipe with solvent jointed fittings. All piping installation shall be in strict accordance with manufacturer's instructions.
- B. Underground hot water and hot water return lines shall be pre-insulated piping equal to Copper-therm by Thermacor or approved equal.
- C. Pipe shall be installed with caution tape and a minimum of twelve (12) inches above the pipe and a tracer wire at a minimum of 18 inches above the pipe.

2.10 CONTROL VALVES

- A. Control valves shall be installed where indicated on Drawings and/or wherever necessary for controlling the several sections of the domestic water system. Valves shall be provided on all inlet (and outlet where applicable) connections to all kinds of apparatuses, all risers and all groups of fixtures. Groups of fixtures shall be arranged to have their group valves in one location. Access shall be provided to all concealed valves by means of an access door. Coordinate the location of valves with the architectural features of the building in order that the access doors will be located symmetrically with other features.
- B. The hot and/or cold water supply lines to each and every fixture hereinafter specified shall be equipped with stop valves which shall be chromium plated where exposed chrome plated pipe is used.

2.11 CROSS CONNECTIONS

- A. Care shall be exercised in fabricating plumbing lines to avoid all cross connections and to construct the piping systems in a manner which eliminates the possibility of water contamination.
- B. The piping systems have been designed in every case to avoid the possibility of reverse flow or back siphoning. Care shall be exercised in constructing plumbing lines to make certain that not only the letter, but the spirit, of these safety precautions is carried out to the fullest possible extent.

2.12 REQUIREMENTS OF INTERIOR WATER PIPING SYSTEMS

- A. All piping shall have reducing fittings used for reducing or increasing where any change in the pipe sizes occurs. No bushing of any nature shall be allowed in piping.
- B. All exposed chrome plated, polished or enameled connections from fixtures shall be put up with special care, showing no tool marks or threads at fittings, and supported by neat racks or hangers with round head screws of same material and finish.
- C. Wade Shokstop, or approved equal, sealed air chambers shall be provided in all water branches to fixtures, sized in accordance with manufacturer's recommendations, concealed, accessible, and located so as to protect each group of plumbing fixtures.
- D. The fabrication of copper pipe and fittings shall in every detail conform to the recommendations and instructions of the fitting manufacturer. The tools used shall be the tools adapted to that specific purpose.
- D. Refer to other parts of this Section and Section 220000 for other information concerning installation of piping.
- E. All supply water lines to sinks, lavatories, and drinking fountains shall be provided with 'no burst lines' flex connectors.

2.13 CONDENSATE PIPING

- A. All condensate piping shall be type "L" hard drawn copper and shall have a minimum slope of one (1") inch/10 feet.

2.14 FLASHING

- A. All plumbing vent pipes and miscellaneous pipes passing through the roof shall be flashed with #4 lead with the base extending eighteen inches (18") on all sides of pipe. Vent pipes shall have lead flashing extending around the vent pipe and over the top of the pipe and beaten down inside of the pipe at least one inch (1").

2.15 INSULATION

- A. Insulation shall be as specified in Section 220700, Insulation for Mechanical Systems.

2.16 VALVES

- A. Valves shall be as specified in Section 220500, Mechanical General Conditions.

2.17 FIXTURES AND EQUIPMENT

- A. Fixtures as hereinafter specified and as indicated on the drawings shall be furnished and installed in a first-class manner with proper connections to the water and drainage systems. All fixtures shall be guaranteed by manufacturer to be free from flaws and defects of any sort in material and workmanship, and to operate perfectly when installed in accordance with the instructions which shall be furnished by the manufacturer. The manufacturer shall agree to replace free of charge, all or any part of the fixture which may show flaws or defect due to fault in manufacture, shipment or storage at any time after installation.
- B. All flush valves to be Zurn, Sloan, or approved equal.
- C. The use of wax ring seals for water closets is prohibited.

PART 3 – EXECUTION

3.01 PIPING IN GENERAL

- A. All plumbing piping must be run as direct as possible, exposed or concealed in accordance with the drawings. All water piping shall be carefully checked so as to avoid all noise due to vibration when water is turned off and on. All vertical pipe shall be rigidly supported or fastened. All horizontal steel or copper pipe shall be supported on not over ten (10') foot centers for pipe two inches (2") and larger and not over six foot (6') centers for smaller pipe. All horizontal soil pipes to be supported on not over five foot (5') centers.
Where indicated and on all water supplies to fixtures, provide capped air chambers not less than sixteen (16") long. All horizontal piping shall be graded so as to drain dry at fixtures when water is shut off.

3.02 DISINFECTING AND FLUSHING OF THE WATER MAIN

- A. Disinfect the domestic water piping system. A chlorine solution of not less than 50 ppm shall be allowed to remain in the piping for six (6) hours. The piping system shall be flushed out before and after disinfecting the system. Entire procedure must be as approved by the State Health Department and Local authorities.

3.03 INSPECTIONS, TESTS AND ADJUSTMENTS:

- A. All tests described below shall be witnessed by a representative of the Engineer's office. The Contractor shall inform the engineer of the time and place to witness the test.

- B. All drain, soil, waste and vent pipes, including branch bends and joints, shall be tested by filling with water and placing a stand pipe to extend ten (10) feet above the system and filling the system and the stand pipe with water. The Contractor may plug the system and hydrostatic test to eight (8) pounds pressure. Install gauge in connection with the test so that the actual test pressure can be observed. If there is a drop in pressure, the system shall be checked and the leaks repaired. Pipe systems may be tested in sections, provided that all portions to be concealed shall be subjected to the above test. If the stand pipe is used for these tests, it shall be not less than two (2) inches minimum in diameter. All lines shall be flushed after removing the test plugs.
- C. Water Piping: All water piping shall be tested to one hundred (100) pounds hydrostatic pressure. Place gauge on system or section of system and gauge shall show no drop in pressure for a period of thirty (30) minutes.
- D. All gas piping systems shall be tested by subjecting the system to a pneumatic test pressure of 100 PSI. While the system is subjected to this air pressure all joints shall have a soapy water solution applied. Any leaks found shall be repaired and the system retested. The system shall then be subjected to the final pneumatic test pressure of 100 PSI and must hold the test pressure for twenty-four (24) hours. Owner to be notified one week prior to test. Test must be recorded and submitted to Engineer for approval
- E. Completion: Upon completion the entire system shall be tested under operating conditions. Water shall be turned into all supply lines. All fixtures shall be demonstrated to operate properly; valves and stops shall be adjusted, packed and repacked as may be required to eliminate leaks and produce proper flow; piping shall be adjusted to provide proper circulation and to prevent hammer, vibration and expansion. The Mechanical Contractor shall obtain and turn over the certificates of inspection and approval from State and Federal authorities having jurisdiction to the Architect.
- D. Contractor shall perform a complete video inspection of all waste and sewer lines prior to acceptance by Owner. Video inspection tapes shall be provided to Owner and Engineer for their review. Any and all debris shall be cleared from all lines by means of pressure jetting or other acceptable method. Follow up video inspections shall be provided as required to satisfy Owner and Engineer of all lines being clear of debris.
- E. Smoke Test: Provide two smoke tests to insure vent systems are not leaking. First test shall be conducted prior to wall closings. Second test shall be conducted after fixtures are permanently connected and traps are filled with water, fill entire drainage and vent systems with smoke under pressure of 1.3 kPa (one inch of water) with a smoke machine. Chemical smoke is prohibited.

3.04 SHOP DRAWINGS

- A. Submit shop drawings on the following:
 - 1. Pipes and fittings,

2. Plumbing fixtures
3. Cleanouts,
4. Plumbing fixtures and,
5. Rough-in modifications,

END OF SECTION 220000

**SECTION 220500
MECHANICAL GENERAL CONDITIONS**

PART 1 - GENERAL

1.1 SCOPE

- A. The scope of the work included under this Division of the specifications shall include a complete mechanical system as shown on the plans and as specified herein. The Architectural General Conditions of these specifications shall form a part and be included under this section of the specifications. The Mechanical Contractor shall provide all supervision, labor, material, equipment, machinery, plant and any and all other items necessary to complete the mechanical system. All other items of equipment are specified in the singular; however, the Mechanical Contractor shall provide and install the number of items of equipment as indicated on the drawings, and as required for complete systems.
- B. It shall be noted that work under this section of the specifications includes Mechanical General Conditions, 220500; Insulation for Mechanical Systems, 220700; Plumbing, 220000; Heating, Ventilating and Air Conditioning, 230000; Test and Balance, 230593; and Energy Monitoring and Control System, 230900.

PART 2 - MATERIALS

2.1 CODES, RULES, PERMITS, FEES

- A. The Mechanical Contractor shall give all necessary notices, obtain all permits and pay all government and state sales taxes, fees, and other costs, including utility connections or extensions, in connection with his work; file all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver same to the Architect before request for acceptance and final payment for the work. The Mechanical Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings, in order to comply with all applicable laws, ordinances, rules and regulations whether or not shown on drawings and/or specified. Refer to General Conditions for additional information.
- B. All materials furnished and all work installed shall comply with the National Fire Codes of the National Fire Protection Association, with the requirements of all governmental departments having jurisdiction. All materials and equipment for the electrical portion of the mechanical system shall bear the approval label, shall be listed by the Underwriters Laboratories, Inc. and bear the UL label. All mechanical equipment, electrical wiring, and devices shall be in accordance with the National Electric Code (NEC).

2.2 INTENT

- A. It is the intention of these specifications and drawings to call for finished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use". Details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.

2.3 SURVEYS AND MEASUREMENTS

- A. The Mechanical Contractor shall base all measurements, both horizontal and vertical from established benchmarks. All work shall agree with these established lines and levels. Verify all measurements at site and check corrections of same as related to the work. Should the Mechanical Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications, he shall notify the Architect, through the General Contractor, and shall not proceed with his work until he has received instructions from the Architect. The Contractor must carefully locate and verify all of the existing utilities to be used as a part of this contract.

2.4 DRAWINGS

- A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the contract. Drawings are not to be scaled. The architectural drawings and details shall be examined for exact locations of fixtures and equipment. Where they are not definitely located, this information shall be obtained from the Engineer, before he proceeds with the work. The Mechanical Contractor shall follow drawings in laying out work and check drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate the Architect shall be notified before proceeding with installation.

2.5 "OR EQUAL"

- A. Wherever the words "approved equal", "equal", or words to the same effect are used in connection with any specified material, it is to be understood that such words mean any material or work of any kind claimed to be an equal in quality to the work or material specified and shall be so approved in writing by the Engineer, except as noted. It is further understood that no material or work shall be presented to the Engineer as work or material equal to that specified without the full understanding on the part of the manufacturers and agents for the so-called "equal" material, and the full understanding on the part of the contractors, that the Engineer is to use his own judgment in the matter; that his decision is final, and that in the event of an adverse condition, no claim of any sort shall be made against the Owner or Architect or Engineer.

2.6 SHOP DRAWINGS

- A. The Mechanical Contractor shall submit for approval detailed shop drawings of all equipment and all material required to complete the project, and no material or equipment may be delivered to the jobsite or installed until the Mechanical Contractor has in his

possession the approved shop drawings for the particular material or equipment. The shop drawings shall be complete as described herein. The Mechanical Contractor shall furnish the number of copies required by the General and Special Conditions of the contract, but in no case less than four (4) copies. Prior to delivery of any material to the jobsite, and sufficiently in advance of requirements to allow the Architect ample time for checking, submit for approval: detailed, dimensions, operating clearances, performance characteristics and capacity. Each item of equipment proposed shall be a standard catalog product of an established manufacturer and of equal quality, finish and durability to that specified.

- B. The Mechanical Contractor shall submit for approval detailed ductwork and mechanical room layout shop drawings; showing coordination between disciplines, see above for submission requirements.

2.7 EQUIPMENT DEVIATIONS

- A. Where the Mechanical Contractor proposed to use an item of equipment other than that specified or detailed on the drawings, which required any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the Mechanical Contractor at his own expense and approved by the Architect. Where such approved deviation requires a different quantity and arrangement of ductwork, piping, wiring, conduit and equipment from that specified or indicated on the drawings, the Mechanical Contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system at no additional cost to the Owner.

2.8 COOPERATION WITH OTHER TRADES

- A. The Mechanical Contractor shall give full cooperation to other trades and shall furnish in writing to the Contractor, with copies to the Architect, any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

2.9 PROTECTION

- A. The Mechanical Contractor shall protect all work and material from damage by his workmen, and shall be liable for all damage thus caused and replace all damaged materials at no cost to the Owner. The Mechanical Contractor shall be responsible for work and equipment until finally inspected, tested and accepted. He shall protect work against theft, injury or damage, and shall carefully store material and equipment received on-site which is not immediately installed. He shall close open ends of work with temporary covers or plugs during storage and construction to prevent entry of obstructing material.

2.10 SCAFFOLDING, RIGGING, HOISTING

- A. The Mechanical Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and deliver onto the premises any equipment and apparatus furnished. The Contractor will remove the necessary equipment from the premises when no longer required.

2.11 EXCAVATION AND BACKFILLING

- A. Mass excavation to approximate building levels will be carried out under a section of the architectural specifications. The Mechanical Contractor shall; however, do all trench and pit excavation and backfilling required for work under this section of the specifications, inside and outside the building, including repairing of finished surfaces, all required shoring, bracing, pumping and all protection for safety of persons and property. Local or State Safety Codes shall be strictly observed. In addition, it shall be the responsibility of the Mechanical Contractor to check the indicated elevation of the utilities entering and leaving the building. If such elevations require excavations lower than the footing levels, the Architect shall be notified of such conditions and a redesign shall be made before excavations are commenced. It is also the responsibility of the Mechanical Contractor to make the excavations at the minimum required depths in order not to undercut the footing. Filling, backfilling and compaction shall be as specified under the architectural sections of these specifications.
- B. Backfill may be native material except that all material from six inches (6") below the pipe bottom to six inches above the top of the pipe must pass a 3/4" sieve. If the native material is determined to be too rocky by the Engineer, he may require imported material for pipe bedding.

2.12 MATERIALS AND WORKMANSHIP

- A. All materials and apparatus required for the work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and furnished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given a first-class standard article as approved by the Architect shall be furnished. The Mechanical Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the installation of the work, together with all skilled workmen, fitters, metal workers, welders, helpers, and labor required to unload, transfer, erect, connect, adjust, start, operate and test each system.
- B. Unless otherwise specifically indicated on the plans or specifications all equipment and materials shall be installed with the approval of the Engineer in accordance with the instructions of the manufacturer. This includes the performance of such tests as the Manufacturer instructs.

2.13 MOTORS

- A. Motors shall be built in accordance with the latest standards of NEMA and as specified. Motors shall be tested in accordance with standard of A.S.A., C50 and conform thereto

for insulation resistance and dielectric strength. Provide motors manufactured by General Electric, Westinghouse, Allis Chalmers or Century designed for quiet continuous operation with forty (40) degrees C. rise at full load and rated speed as individually specified. Motors shall be of the same make except those incorporated in package units, and all, including those in package units, shall be provided with ball bearings and conduit connection boxes. Unless stated otherwise, motors 1 HP and smaller shall be suitable for operation of single phase, 60 cycle, and 120 volt current. All motors shall be provided with thermal overload protection. Motors 1 HP or larger shall be either 208 volt or 480 volt, three phase as scheduled. Two speed, three phase motors shall be dual winding.

- B. All motor starters shall be provided by the Mechanical Contractor if integral with the equipment. All three phase magnetic starters shall be furnished with three coil overload protection. All starters which are not integral with the equipment and other electrical control equipment installed in damp, moist or areas of special conditions, shall be designed and approved for the installation.

2.14 QUIET OPERATION AND VIBRATION

- A. All work shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Architect/Engineer. In case of moving machinery, sound or vibration noticeable outside its own room will be considered objectionable. Sound or vibration conditions considered objectionable by the Architect shall be corrected in an approved manner by the Mechanical Contractor at his expense. Vibration control shall be by means of approved vibration eliminators in a manner as recommended by the manufacturer of the eliminators.

2.15 ACCESSIBILITY

- A. The Mechanical Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of his work. The Contractor shall cooperate with the General Contractor and all other contractors whose work is in the same space, and shall advise the General Contractor of his requirements. Such spaces and clearances shall; however, be kept to the minimum size required. The mechanical Contractor shall locate all equipment which must be serviced, operated or maintained in fully accessible positions. Equipment shall include but not be limited to: valves, traps, cleanouts, motors and controllers. If required or better accessibility, any change shall be approved by the Architect. The Mechanical Contractor shall provide the General Contractor the exact locations of access panels for each concealed valve, control, damper or other device requiring service. Access panels not shown in the architectural drawings shall be provided and installed by the Mechanical Contractor and as specified in architectural sections of the specifications. Locations of these panels shall be submitted in sufficient time to be installed in the normal course of work

2.16 FOUNDATIONS, SUPPORTS, PIERS, ATTACHMENTS

- A. The Contractor shall furnish and install all necessary foundations, supports, pads and bases required for all equipment furnished under this contract, unless otherwise noted.

All equipment where foundations are indicated, furnish and install concrete pads as shown. All pads shall be extended six inches (6") beyond equipment base in all directions with top edge chamfered. All equipment, unless otherwise shown, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are, in the opinion of the Architect, not strong enough shall be replaced as directed.

2.17 ELECTRICAL CONNECTIONS

- A. The Electrical Contractor shall furnish and install all power wiring except the following when rated at 25 VAC or less: (1) temperature control wiring; (2) equipment control wiring; and (3) interlocking wiring. The Electrical Contractor shall furnish and install all power wiring complete from power source to motor or equipment junction box, including power wiring through starters. The Electrical Contractor shall furnish and install all starters not factory mounted on equipment or otherwise noted. The Mechanical Contractor shall furnish and install all temperature control wiring, interlock wiring and equipment control wiring of 25 VAC or less for the equipment that he furnishes. The Mechanical Contractor shall furnish a starter to the Electrical Contractor, where scheduled on the drawings or integral with the equipment. The Mechanical Contractor shall provide and be responsible for the heater in all starters that the Mechanical Contractor furnishes.

2.18 CUTTING AND PATCHING

- A. The Mechanical Contractor shall be responsible for all framing, cutting and patching necessary to install the work specified in this section. Patching shall match adjacent surfaces and be performed by qualified workmen approved by the Architect. All work shall be in accordance with the applicable Architectural section of these specifications.

2.19 SLEEVES AND PLATES

- A. The Mechanical Contractor shall provide and locate all sleeves and inserts required before the floors and walls are built, or shall be responsible for the cost of cutting and patching required for pipes where sleeves and inserts were not installed, or where incorrectly located, or where they are to be installed in existing walls. Sleeves shall be provided for all mechanical piping passing through concrete floor slabs, masonry, concrete, tile and gypsum wall construction. Where sleeves are placed in exterior walls below grade, the space between the pipe or conduit and the sleeves shall be sealed with link-seal rubber expansion sealers or equal and be made completely watertight. Sleeves shall be constructed of twenty-four (24) gauge galvanized sheet metal with lock seam joints for all sleeves set in concrete floor slabs terminating flush with the floor. All other sleeves shall be constructed of steel pipe unless otherwise indicated on the drawings.

2.20 ESCUTCHEON PLATES

- A. Escutcheon plates shall be provided for all exposed uninsulated pipes and all exposed conduit passing through walls, floors and ceilings. Plates shall be nickel-plated, of the

split ring type, sized to match the pipe or conduit. Where plates are provided for pipes passing through sleeves which extend above the floor surface, provide deep recessed plates to conceal the pipe sleeves.

2.21 WATERPROOFING

- A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Architect before work is done. The Mechanical Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

2.22 GUARDS

- A. The Mechanical Contractor shall provide belt drivers and rotating machinery with readily removable guards. Guards not furnished with equipment requiring it shall consist of heavy angle iron frames, hinged and latched, with heavy galvanized iron wire crimped mesh securely fastened to frames.

2.23 OPERATING INSTRUCTIONS

- A. Upon completion of all work and all tests, the Contractor shall furnish the necessary skilled labor and helpers for operating this system and equipment for a minimum period of three (3) days of eight (8) hours each. During this period, instruct the Owner or his representative fully in the operations, adjustment, and maintenance of all equipment furnished. The Mechanical Contractor shall furnish to the Architect four (4) complete bound sets for delivery to the Owner of typewritten or blueprinted instructions for operating and maintaining all systems and equipment included in this contract. All instructions shall be submitted in draft, for approval, prior to final issue. Mount at a location determined by the Owner, a step-by-step procedure to operate the system in a frame covered with a glass front. The Mechanical Contractor shall include the maintenance schedule for the principal items of equipment furnished under this contract.

2.24 PIPING INSTALLATION

- A. All piping at one or more points shall be installed so that they can be easily drained. Provide means of drainage of low points of all piping without disconnecting pipe. If other than valves are contemplated, the Architect's permission shall be obtained. All installed pipelines shall be straight and remain straight against strains tending to cause distortion, noise, damage, or improper operation. Piping shall be installed square with the building construction and risers shall be plumb. All piping must be kept clean and free from scale or loose dirt when installed, and must be kept clean during the completion of the installation. All openings in the piping system shall be capped or plugged while awaiting further connection whenever there is a reasonable hazard of dirt entering the piping system. Soil, waste and drainage lines shall be properly graded. Cold water, domestic hot water and gas lines shall be slightly pitched toward drain points.

2.25 PIPE HANGERS AND SUPPORTS

- A. Horizontal piping shall be suspended from the overhead structure with Grinnell Co. pipe hangers and anchors and threaded rods. Perforated metal straps will not be allowed on the job. Hangers shall be installed to allow for continuity of insulation. Maximum hanger spacing shall be six feet (6').

2.26 VALVES

- A. Unless otherwise specified, all valves shall be Nibco.
- B. Domestic water use suitable for 125 PSI working pressure. Ball or butterfly valves shall be used on domestic water piping.
- C. Ball valves or cast iron greaseable plug valves shall be used in gas lines.
- D. Ball valves or butterfly valves shall be used on heating and cooling system water. Ball valves shall be soldered or threaded through two inch (2"), two piece body construction rated for 400 PSIG WOG, chromium plated or stainless steel standard ball port. Butterfly valves shall be cast iron body construction rated for 200 PSIG with an encapsulated stem and disc.
- E. Valve locations are either shown or covered by note on the plans. However, the Contractor shall be held responsible for furnishing and installing all valves inadvertently omitted from the drawings in locations where valves are customarily furnished for operation and maintenance without undue disruption of service.
- F. The Mechanical Contractor shall prepare and install in a suitable glazed frame, typewritten valve charts giving the number, location and function of each line and valve installed under this contract. Provide and install for each valve a stamped brass tag, numbered to correspond to the number indicated on the valve chart. Tags shall be secured to valve stems by heavy, figure-eight hooks.

2.27 UNIONS

- A. Unions shall be provided at all equipment and wherever else necessary to allow for ease in making repairs or replacements. Furnish and install approved insulating couplings at all connections between dissimilar metals, steel to copper.

2.28 INSTALLATION OF THREADED PIPE

- A. Screw joints shall be made with lubricant applied to the male threads only; threads shall be full cut and not more than three (3) threads on the pipe shall remain exposed. All new cut ends must be deburred and reamed.

2.29 JOINTS IN COPPER WATER PIPING

- A. The pipe shall be cut square and true. The end shall be deburred, reamed, and/or sized as necessary. The pipe shall be cleaned with medium grit emery cloth and if the fitting socket is tarnished or shows oxidation, it shall be likewise cleaned. The pipe and fitting shall be fluxed with Nokorode Paste. Joints shall be made up with the type of solder as

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hereinafter specified. Reducing tees formed by extruding the larger pipe will not be acceptable for pipe two (2") inches or smaller. On pipe 2-1/2 inches and larger extruding the reducing tee will be acceptable provided flux is applied to both tee and pipe and the joint silver soldered with a torch using a mixture of oxygen and acetylene.

2.30 IDENTIFICATION OF PIPING

- A. All service piping which is accessible for maintenance operations will be identified with SETMARK semi-rigid plastic markers or equal. Direction of flow arrows are to be included on each marker, unless otherwise specified. For pipes under 3/4" OD, brass identification tags 1-1/2" in diameter will be fastened securely at specified locations.

- B. Locations for pipe markers to be as follows:

At each pipe passage through wall, floor and ceiling construction.
At each pipe passage to underground.
On all horizontal pipe runs - marked every 15 feet.
At each branch and riser take-off.
Adjacent to each valve and fitting (except on plumbing fixtures and equipment)

- C. Provide ceiling tack markers at all location of equipment located within ceiling space. Including terminal units, fan coil units, etc...

PART 3 - EXECUTION

3.1 SYSTEM TEST AND CLEANING

- A. Scope: Before the final air balance test, the heating, ventilating and air conditioning system shown on the drawings shall be tested to assure performance of all units. District personnel to be present during startup procedures.
- B. Heating System: The entire heating system shall be tested at the completion of the building and it shall be established that all controls are calibrated accurately and performing satisfactorily and that all units are heating satisfactorily. The system shall be checked for vibration and excessive noise and all such conditions corrected.
- C. Air Conditioning System: The entire air conditioning system shall be tested at the first summer weather next following the completion of the building; and it shall be established that all controls are calibrated accurately and performing satisfactorily and that all units are cooling satisfactorily. The system shall be checked for vibration and excessive noise and all such conditions corrected.
- D. Ventilating System: The entire ventilation system shall be tested at the completion of the project; and it shall be established that controls are performing satisfactorily and that all

rooms are ventilating properly. The systems shall be checked for vibration and excessive noise and all such conditions corrected.

- E. Final Check-up: At the completion of all work all equipment on the project shall be checked and thoroughly cleaned including coils, plenums, pipes, plumbing fixtures, etc., and all other areas around or in equipment provided under this section. Any filters used during construction shall be replaced with new filters after final clean up. All start-up strainers shall be removed and replaced with operating strainers. Strainer mesh shall be approved by the Engineer.
- F. Painting: At the completion of all work all equipment on the project shall be checked for painting damage, and any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal or specially covered areas that have been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.2 LUBRICATION OF EQUIPMENT

- A. The Mechanical Contractor shall properly lubricate all pieces of equipment before turning the building over to the Owner. He shall attach a tag to each motor showing the date of lubrication and lubricant needed.

3.3 GUARANTEE

- A. The entire mechanical system shall be guaranteed for a period of one year after final acceptance of the project against any defects in equipment, material or workmanship. Any necessary labor, equipment or material required to correct such defects shall be furnished and paid for by the Mechanical Contractor without further cost to the Owner. Provide the Owner a written guarantee on the above item. Deliver to the Architect for his approval.

END OF SECTION 220500

**SECTION 220700
INSULATION FOR MECHANICAL SYSTEMS**

PART I - GENERAL

1.1 GENERAL

- A. Conditions of the contract and Division I apply to this Division except that any requirements for prior approval of equipment does not apply to this Division. The work under this section consists of furnishing and installing all thermal insulation on ducts, pipes and all other equipment in Division 22 and 23 which are indicated to receive insulation. See also Section 220500 for General Requirements applying to this and all other Division 15 sections.

1.2 SUBMITTAL DATA

The following submittal data shall be provided before any installation is made: Name of the Insulation Contractor; a narrative summary of material and method of installation for each system or component to be insulated (i.e. domestic water piping, ductliner, etc.); certified letter of compliance as required hereinafter; and descriptive literature for all material including insulation, covering, jackets, adhesives, etc.

PART 2 - PRODUCTS

2.1 GENERAL INSULATION

All insulation materials shall have composite fire and smoke hazard ratings as tested by procedure ASTM-84, NFPA-255, and UL 723 not exceeding: smoke developed - 50; flame spread - 25; fuel contributed - 50. All components of the insulation (insulation, adhesives, and jackets or facings) shall have been tested as COMPOSITE product and shall bear labels showing the flame spread, smoke-developed, and fuel contributed properties do not exceed 25, 50 and 50 respectively. All insulation accessories (glass cloth, cement, adhesives, mastic, etc.) shall have the same component ratings as listed above. All products and/or their shipping cartons shall have a label affixed, indicating flame, fuel and smoke ratings do not exceed the above requirements. Paper laminate jacket, if used, shall be permanently fire and smoke resistant. Chemicals used for treating paper in jacket laminates shall not be water soluble and shall be unaffected by water and humidity. The use of canvas or other flammable materials is prohibited and any found on the job shall be removed at the Contractor's expense and at no additional cost to the Owner. The insulation and related items specified hereinafter by specific manufacturer's designation is intended to establish a standard of quality and is not intended to exclude equal products of reputable manufacturers. Acceptable manufacturers: Owens Corning, Johns Manville, Knauf, or approved equal.

2.2 PIPING SYSTEMS

- A. Piping shall be insulated by the following schedule with Owens/Corning Fiberglass 25 ASJ/SSL pipe insulation all service jacket with self-sealing lap.

PIPING TYPES	PIPING SIZES		
	1/2"-1"	1-1/4"-4"	4" +
Recirculated hot water	1"	-	-
Domestic cold water	1/2"	1/2"	-
Domestic hot water	1"	2"	2"
Condensate	1"	1"	1"
Chilled and Heating Piping	2"	2"	2"

- B. Manville Flame-Safe GC or Armstrong Accotherm insulation of thermally equivalent thickness may be used in lieu of the above.
- C. All piping including domestic cold water piping which is exposed outside the building or installed within an unconditioned space shall be insulated with a minimum of one inch (1") insulation or as specified above. Provide metal jacketing as described below. See drawings for heat tape requirement.
- D. Heat tape shall be self regulating, thermoplastic outer jacket over tinned copper or mixed braid. Voltage shall be 120VAC/1ph. Provide all necessary terminations/splice kits, end seals, junction boxes, and thermostat control for a complete system as manufactured by HEATTRACE model FSM, or equal. Digital thermostat shall be preset for freeze protection, have indicators for main on/heater on as manufactured by HEATTRACE model AT-F, or equal. Provide nema enclosure for t-stat when installed outside or provide remote sensing. Provide on exterior chilled water piping to chillers.
- E. All insulated piping which runs exposed, either inside or outside the building, shall be jacketed with aluminum sheet metal, banded 4" on center and sealed water tight. All joints shall be caulked with silicon caulking/sealer. Piping running exposed within boiler rooms and mechanical rooms shall have PVC jacketing. Piping above 10 feet from a finished floor, platform or bleacher shall not be required to be jacketed.

2.3 DUCT SYSTEMS

- A. All metal air conditioning ducts indicated to have ductliner or exposed/ visible from occupied space shall be lined with thermal and acoustic ductliner, Manville Linacoustic or approved equal, approved by the City of El Paso, 1-1/2 pound per cubic foot density, 1 1/2" thick or equivalent unless otherwise noted on the plans having a thermal conductance of 0.25 BTU/sq. ft./hr./degree F./inch thickness at 75F. mean temperature and with a noise reduction coefficient (NCR) of .20, Underwriters Laboratories Inc. fire hazard classification of flame spread 25, fuel contributed 50 and smoke developed 50 or better.

- B. Ductwrap shall be used on all ducts indicated to be insulated. Ductwrap shall be Manville Microlite Duct Insulation, 1.0 PCF density, 2" thick with a thermal conductivity equal to .265 at 75 degrees F. Wrap shall have an FSK fiberglass reinforced foil face.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Pipe Insulation shall be applied on clean, dry surfaces. All insulation shall be continuous through opening and sleeves. Insulation on all cold surfaces where vapor barrier jackets are used must be applied with a continuous, unbroken vapor seal. Hangers, supports, anchors, etc., that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation. Inserts between the pipe and pipe hangers shall consist of a length of rigid pipe insulation of thickness equal to the adjoining insulation and shall be provided with vapor barrier where required. Insulation inserts shall not be less than six inches (6") long.
- B. Metal shields shall be applied between all hanger or supports and the pipe insulation unless otherwise noted. Shields shall be formed to fit the insulation and shall extend up to the centerline of the pipe and the length specified for the hanger inserts. All fittings and valves shall be insulated by wrapping with fiberglass blanket, wrapped firmly under compression to thickness equal to adjoining pipe insulation.
- C. Longitudinal jacket laps and butt strips shall be smoothly secured with adhesive. Valves and fittings, except unions and flanges, may be insulated with factory premolded Zeston Hi-Lo Temp PVC one-piece insulated fitting covers of the same thickness as the adjacent pipe insulation. The fitting covers shall be secured by stapling or tack fastening. Insulation shall be beveled at ends with insulation cement at check valves, valves, unions and flanges. These items then shall be separately insulated with larger sectional insulation overlapping the adjacent insulation such that the valve or other fitting so insulated may be uncovered without damage to the adjacent piping covering. Strainers shall be insulated in such a manner that the basket may be removed without damage to the adjacent insulation. Valves shall be insulated to the bonnet only. All exposed raw end of insulation shall be finished with insulating cement.

3.2 DUCT INSULATION

- A. Ducts indicated to have internal insulation shall be lined by carefully adhering the liner in a continuous piece to clean, flat metal sheets with quick-tacking rubber base adhesive. The duct shall be formed, with the liner attached, in a sheet brake. The coated side of the liner shall face the air stream, and all exposed edges shall be coated with adhesive. Ducts shall also have the liner additionally secured with mechanical fasteners. Spacing of fasteners shall be on approximately fifteen inches (15") centers, and shall be adhered with manufacturer's recommended adhesive. The insulation shall be held in place with surface anchor washers, speed clips or equal. All projecting ends of fasteners shall be cut off flush with washer.

- B. Ductwrap shall be applied in strict accordance with manufacturer's instructions. Wrap shall be continuous with overlapping sections. Fasten and seal overlap joints according to manufacturer's recommendations.
- C. Insulation shall be butted tightly at joints and vapor barrier facing shall be overlapped a minimum of two (2") inches. Insulation should be removed from lap prior to stapling. All seams shall be stapled approximately six (6") inches on center with outward clinching staples, then sealed with a foil vapor barrier tape or vapor barrier mastic.
- D. Where ducts are over 14" in width, the ductwrap shall be additionally secured to the bottom of rectangular ducts with mechanical fasteners spaced on 18" centers (maximum) to prevent sagging of insulation. Seal penetrations of facing so as to provide a vapor-tight system.

3.3 SHOP DRAWINGS

Data sheets for pipe and duct insulation systems.
Adhesives, and
Fitting and valve covers.

END OF SECTION 220700

SECTION 230000
HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.1 CONTENTS

- A. This section of the specifications contains items applicable only to the Heating, Ventilating and Air conditioning system. Section 220500, Mechanical General Conditions and Section 220700, Insulation for Mechanical Systems, contains items which also apply. This section of the specifications supplements and modifies some of the statements herein as to apply specifically to the heating, ventilating and air conditioning system.

1.2 SCOPE

- A. It is the intent of these specifications and drawings to furnish a heating, ventilating and air conditioning system inside and outside of the building, complete, fully adjusted and ready to use. All work and material must conform to all State and Local Codes in every respect.

PART 2 - PRODUCTS

2.1 INSULATION

- A. Insulation shall be as specified in Section 220700, Insulation for Mechanical Systems.

2.2 VALVES

- A. Valves shall be as specified in Section 220500 Mechanical General Conditions.

2.3 SHEET METAL

- A. All ductwork shall be fabricated and installed so that no undue vibration or noise results. All joints shall be airtight with additional caulking provided if necessary. Ducts shall be constructed of the best grade galvanized mild steel sheets with joints and reinforcing in accordance with the recommended construction as listed in the current edition of HVAC Metal Duct Construction Standards - SMACNA. Ductwork installed between outlet of air handling units and terminal units shall be constructed to 4 " water gage pressure class and sealed to class A sealing requirements. Ductwork downstream of terminal units, fan coil units, evaporative coolers, and downstream of exhaust fans shall be constructed to 1" water gage pressure class and sealed to class B sealing requirements. Hang ducts with straps attached to bottom of ducts spaced in accordance with SMACNA Standards. Curved elbows, if used, shall have a center line radius equal to 1-1/2 times the duct width. Square elbows shall have turning vanes equal to HEP Aerodyne Co. ductturns. Job fabricated vanes will not be accepted without prior approval.

- B. Provide all necessary dampers as required for proper adjustment and control of air distribution. Provide volume extractors similar to Metalaire Airtrol extractors set at 20 degrees at all branches in ductwork where other means of control are not indicated or used, and in ductwork behind sidewall supply registers. All damper rods shall be marked to indicate the relative position of the damper lade with respect to rod.
- C. Provide one inch (1") angle collars for all exposed ducts passing through walls, ceiling or floors. Anchor collars in position after installation is complete.
- D. Provide flexible connection at inlet and discharge connections of fans and air handling equipment to prevent mechanical noises from being transmitted to connecting ductwork. Use flexible connection similar and equal to "Ventfab".
- E. Install hinged doors on ductwork and housing to provide access to all parts of every automatic damper, fire damper and all other items requiring maintenance or inspection. Access doors shall be 18" X 12" if permitted by duct size, and if not, shall be as large as possible. All access panels shall have sponge rubber gaskets cemented in place with cam lock closures.
- F. Shop Drawings shall be submitted on all items of sheet metal work specified herein. Shop Drawings of ductwork at air units shall be submitted at a minimum scale of 3/8" equal to one foot.
- G. Shop Drawings shall be submitted on all other ductwork. Shop Drawings shall indicate location of all supply, return, exhaust and light fixtures from the approved reflected ceiling plans. Coordinate with Structural and Architectural drawings to avoid any conflicts.

2.6 FLEXIBLE DUCT

- A. Flexible duct connectors shall be constructed of galvanized spring-steel-wire helix with a two-ply airtight inner core; nominal one inch (1") thick fiberglass insulation and vinyl vapor barrier, suitable to two inch (2") water gauge. Medium pressure duct connection to VAV box terminals shall be rated to a minimum 4" water gage. Entire duct assembly shall be listed to UL label and shall be Thermoid, Portoduct Type 1 or equal. Maximum length of each run shall be eight (5') feet and supported without sagging. Flex duct shall be allowed only where indicated on the drawings.

2.7 VIBRATION

- A. Ductwork shall be isolated from rotating or reciprocating equipment to which it is attached by means of a flexible connection. See sheet metal specification elsewhere herein for exact requirements. Equipment base isolators shall be provided where detailed on the drawings for equipment on floors, pads or bases.

2.8 GRILLES, REGISTERS, DIFFUSERS

- A. Furnish and install grilles, registers, diffusers and accessories of size and type as indicated on drawings. All to be as manufactured by Nailor, Metal-Aire, Carnes, Titus, or approved equal. See the schedule on the drawings for type and model.

2.9 EXHAUST FANS

- A. Furnish and install roof-mounted exhausters as scheduled on the drawings. Exhaust fans shall be steel or aluminum construction, belt-driven as indicated with birdscreen and backdraft dampers unless otherwise noted. Furnish an aluminum prefabricated curb, compatible with the exhauster where indicated. All exhaust fans shall be Acme, Cook, Jenn-Fan, Greenheck, Carnes, or approved equal. All exhaust fans are to be controlled via wall mounted on/off switch and monitored by EMCS system.

2.10 VARIABLE TERMINAL UNITS:

The contractor shall furnish and install pressure independent dual and/or single duct variable air volume control assemblies with integral attenuator (single duct units) and attenuator-mixers (dual duct units), of the sizes, capacities and configurations shown on the Drawings.

A. CASING CONSTRUCTION:

1. The units shall be constructed of a minimum of 22 gauge galvanized steel and internally lined with a minimum of 1 inch thick, three pound per cubic foot density insulation. The insulation shall be foil faced with the edges and seams sealed or "captured", encapsulating all fibers of the insulation. The insulation shall be neatly installed with no rough edges to interrupt the smooth flow of air through the box. The casing shall be insulated throughout its interior, up to or at least to within 2" of the heating coil connection. Insulation for the heating coil shall enclose the coil casing and tube bends and shall overlap the box internal lining by at least 3". The external insulation shall be as specified in other sections of this specification for duct insulation with full vapor barrier, and shall be field installed unless coil and plenum section is furnished as an integral part of the box.
2. All interior features of the boxes (such as mixing baffles, damper housings, etc.) shall be secured within the casing to avoid excessive movement or rattling with air movement or externally generated vibration. All external features of the terminal units shall be designed not to extend beyond the ends of the unit. (For example, the actuator mounting brackets, etc. shall not extend beyond the plane of the inlet "bulkhead.") The only exception shall be flow sensors installed in the inlet duct connections. Note that if a separate flow station is installed within a frame within the casing, then it shall be so installed not to allow air flow to bypass the flow measurement station.

3. The terminal units shall be constructed with inlet and discharge ductwork connections. The inlet ductwork connections shall extend a minimum of 4 inches from the unit casing including an allowance for the installation of air flow station(s) or probe(s). The discharge connection shall include 1" extension with slip and drive connections for use by the contractor to secure the discharge ductwork or appurtenances to the unit and shall be reinforced to provide a rigid assembly.
- B. CASING LEAKAGE: Assembled Units shall be so constructed and sealed to limit air leakage to the following listed quantities at 6" static pressure. Leakage curves or tables will be required as part of the submittal data. The following is the maximum allowable casing leakage including all components:

<u>Diameter</u>	<u>Maximum Allowed CFM (Area x 2000 fpm)</u>	<u>Maximum Allowable CFM Casing Leakage</u>
4"-5"-6"	393	8.0
7"-8"	698	14.0
9"-10"	1091	22.0
11"-12"	1571	30.0
13"-14"	2138	40.0

- C. Not used
- D. DAMPER CONSTRUCTION: The damper blades shall be an equivalent of 18 gauge galvanized steel or equal aluminum and shall be securely riveted or bolted through the damper shafts to assure no slippage of the blades. The damper shafts shall operate in rust-proof self-lubricating bearings. Damper shafts penetrating the unit casings shall be sealed against leakage, and bearings shall be installed for protection against wear in the casing penetration. Damper shafts shall be formed of, or cut from solid stock; no hollow shafts will be allowed. The dampers shall seat against gasketed stops or the dampers shall have gasketed edges. The dampers shall be so constructed to prevent "oil canning" of the damper blade. The units shall be tested for leakage in both inlets with 6" static pressure imposed on one inlet at a time. The maximum percent leakage from all tests shall be reported. Leakage curves as a function of pressure shall be supplied as part of the submittal data. The damper actuator linkage, if used, shall be constructed of material of sufficient strength to avoid buckling under extreme loads. Also, linkages shall not allow play greater than 5 degrees of damper movement. The controls for the dampers shall cause the dampers to fail in the position of last control (freeze in place), or fail to the open position.
- E. DAMPER LEAKAGE: The following is the maximum damper leakage allowable for the various size diameter inlets at 6" w.g. differential pressure. The damper

leakage shall not exceed the values listed in the table below at 6" S.P., following ARI 880 Testing Procedures.

<u>Diameter</u>	<u>Maximum Allowed CFM (Area x 2000 fpm)</u>	<u>Maximum Allowable CFM Damper Leakage</u>
4"-5"-6"	393	6.0
7"-8"	698	10.5
9"-10"	1091	16.5
11"-12"	1571	20.0
13"-14"	2138	30.0

- F. UNIT PRESSURE DROP: For dual duct units with an integral attenuator-mixer, but with no other accessories, the static pressure across the assembly with an equivalent 2000 fpm inlet velocity through one inlet shall not exceed 0.50 inches water gauge, with the total flow through either inlet. Single duct unit pressure drop shall be limited to 0.15 inches water gauge under the same conditions above.
- G. CERTIFICATION: The Unit Manufacturer shall certify that each unit used on this project will perform as specified. Each unit shall bear a tag or decal listing the following specified information:
- | | |
|-------------------------|-------------------------------|
| a) Test Pressure | e) Room or area served |
| b) Leakage CFM (damper) | f) Unit size - 6", 8", etc |
| c) Leakage CFM (casing) | g) Calibrated CFM, ie 800 CFM |
| d) Date of Mfg. | |
- H. MIXING: Dual duct terminal units as specified herein shall provide mixing within the units, and not rely upon the discharge ductwork to provide for the completion of the mixing process. The horizontal average temperature of the air as it leaves the terminal unit shall not vary more than 1°F for each 20°F. of temperature difference between the two inlet air supplies. (For example, if the cold supply air is 55°F. and the hot supply air is 95°F., the difference is 40 degrees. The allowable temperature variation of the discharge air is, thus, 2°F.) The temperature of the discharge air shall be measured using a pattern of four vertical, evenly spaced columns, and three horizontal, evenly spaced rows. The rows and columns shall be spaced so that the resulting 12 points shall be at the centers of equal areas. The plane of the points shall be perpendicular to the direction of air flow, within 4 inches of the discharge of the terminal unit, within the discharge ductwork. The three readings in each column shall be averaged to determine compliance with the 1° criteria.
- I. FLOW MEASUREMENT: Air flow thru the unit shall be accomplished by the use of a multi-port sensing device with a minimum of four radially distributed pick-up points connected to a center averaging chamber with adequate internal

passages to prevent restrictions that can result in control 'hunting'. On all systems, sensors shall be **mounted as required by the temperature controls supplier.**

- J. SOUND: (Note that the maximum sound levels listed in this paragraph refer to raw sound levels, with no credits taken for the construction.)

DISCHARGE SOUND

Maximum discharge Sound Power Levels at 2000 fpm primary air inlet velocity with 1.5 inch w.g. inlet static pressure shall not exceed that listed in the following table. No credit for lined discharge duct, branching, flow division, end reflection, room absorption or any other effects shall be allowed.

Octave Band	Center Frequency (Hz)	Sound Power Level (dB re 10 ⁻¹² Watts)
2	125	76
3	250	66
4	500	63
5	1000	58
6	2000	60
7	4000	55

RADIATED SOUND

Maximum discharge Sound Power Levels at 2000 fpm primary air inlet velocity with 1.5 inch w.g. inlet static pressure shall not exceed that listed in the following table. No credit for ceiling plenum, ceiling tiles, room absorption, or any other effects shall be allowed.

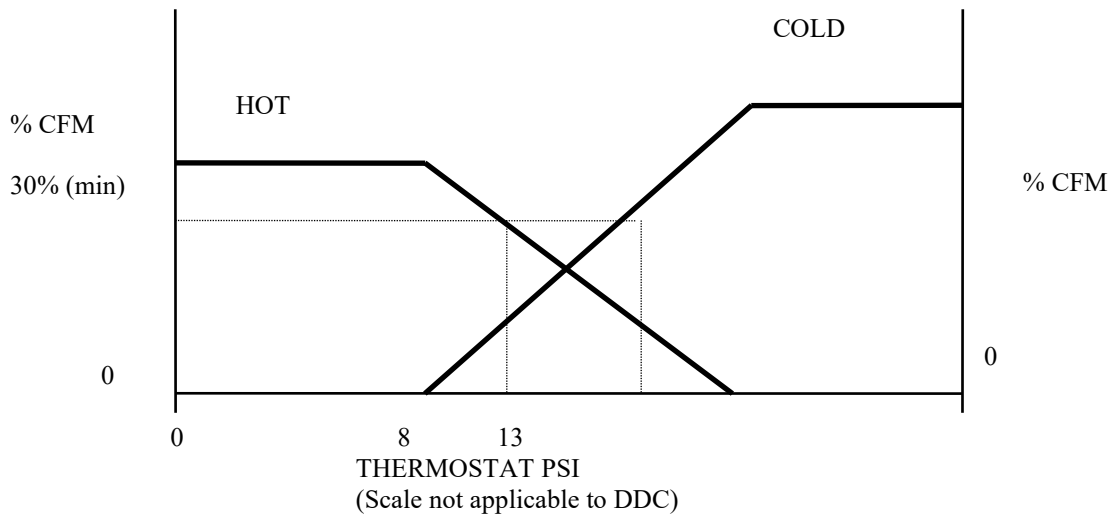
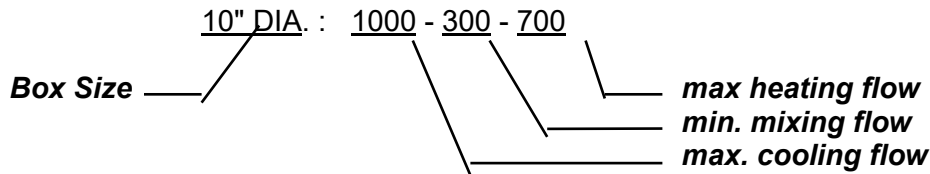
Octave Band	Center Frequency (Hz)	Sound Power Level (dB re 10 ⁻¹² Watts)
2	125	72
3	250	67
4	500	64
5	1000	54
6	2000	47
7	4000	45

All sound power levels shall be obtained from testing in accordance with ARI-ADC Standard 880 and shall be certified at ARI-880 certification points.

- K. TESTING PRIOR TO INSTALLATION: NOT REQUIRED

- L. MANUFACTURER: All Terminal Units shall be as manufactured by Titus
- M. GENERAL PERFORMANCE: Devices using mechanical CFM limiters will not be accepted, nor shall it be necessary to change control components to make airflow rate changes. DDC flow stations shall be furnished, mounted and adjusted by the terminal unit assembly manufacturer to assure their proper placement within the units. DDC controls of another manufacturer (NOT the terminal unit manufacturer) are provided for this project, the terminal unit manufacturer shall be responsible only for the construction of the terminal unit and the installation of internal control components installed at the manufacturers factory, and shall not be responsible for the installation of controls not installed at the terminal unit manufacturers factory, nor shall the manufacturer be responsible for the performance of the DDC controls. The performance of DDC controls, especially in connection with terminal units, shall be the responsibility of the DDC controls manufacturer.
- N. Not used
- O. CONTROL PERFORMANCE: Assemblies shall be able to be reset to any airflow between zero and the maximum cfm shown on Drawings. To allow for maximum flexibility and future changes, it shall be necessary to make only simple screwdriver or keyboard adjustments to arrange each unit for any maximum air flow within the ranges for each inlet size as scheduled on the Drawings. The control devices shall be designed to maintain the desired flow regardless of inlet flow deflection. All terminal units shall be installed with a minimum of four diameters of straight duct directly prior to the entry into each terminal unit connection.
- P. CONTROL SEQUENCES:
- The control sequence arrangements shall be as described below, whether the controls used on this project are pneumatic or DDC, and the terminal units shall be shipped from the manufacturer with all necessary control devices to accomplish each sequence, except as may be prohibited by the controls manufacturer. The desired sequence shall be adjustable according to space usage or a change in space conditions.

Dual Duct Units - VAV



Separate maximum CFM values for hot and cold ducts with zero minimum flow values for both hot and cold ducts, with adjustable mixing of hot and cold air flow to allow for adjustable minimum total air flow from the terminal unit. Note that the minimum air flow is shown as 30 percent of the nominal air flow for the individual terminal unit. (Nominal air flow is defined as the flow to the unit at an average velocity of 2000 fpm through one inlet.)

Q. Not used

R. DDC SYSTEMS:

1. Electronic motors and controllers shall be installed by the terminal unit manufacturer unless specifically prohibited by the controls manufacturer. In such an event, the controls manufacturer shall be responsible for the installation of the controls. The controls manufacturer shall be responsible for the operational performance of the entire system. The terminal unit manufacturer shall remain responsible only for the performance of the mechanical components of the unit.
2. DDC Controls Protocol/Description: must be coordinated with UMC

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. All work shall be first-class in every respect and shall be done by mechanics skilled in the trade involved. Careless and/or sloppy work shall be resolved and replaced properly at the Contractor's expense.

3.2 SCHEDULING OF WORK

- A. The Contractor shall be required to confer with the Architect, General Contractor and Owner to determine a schedule of times at which the various items of work are to be accomplished.

3.3 CONSULTATION WITH OTHER CONTRACTORS

- A. Before commencing the work, the Contractor shall consult with the General Contractor and other Subcontractors and arrive at a thorough understanding as to the location of all equipment, ducts, etc., so that there will be no interference with other work. The time of installation of sleeves, etc. shall be determined by the Contractor. In the event he

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should fail to have material on the job and such provisions are not made previously with the Gen. Contractor, necessary arrangements shall be made at the expense of the Contractor.

3.4 CLEANING, TESTING AND ADJUSTING

- A. The Contractor is cautioned to instruct his mechanics to keep all equipment, ducts and materials free of foreign materials during installation. Any malfunction of the several system resulting from sand, rocks and other foreign material in the systems shall be corrected at the Contractor's expense. Upon completion of the work, the Contractor shall thoroughly cleanout the several duct system. The Contractor shall take precaution during the cleaning operation to protect his work and the work of all other trades and should any damage be done, he shall remedy or repair it to the complete satisfaction of all concerned, and at no additional cost to the Owner.
- B. Functional Tests: Make specific tests of all equipment and materials and portions of this installation as required herein to prove their condition and performance and any tests as required by any authority having jurisdiction over this type of installation. The Contractor shall adjust all equipment, air quantities, controls and devices, so that all components of the various systems are left in proper working order. As part of this test the entire piping system shall be pressurized to 100 PSI for four (4) hours. These tests must be witnessed by a representative from the Engineer's office. All hydronic piping to be flushed out and chemical added.

3.5 START UP

- A. It is the responsibility of the Mechanical Contractor to arrange a minimum two (2) day start-up program. A factory representative for the Owner, the Engineer, and the Mechanical Contractor shall be on the site. The purpose of this start-up is to run the system thoroughly and determine that it is functioning satisfactorily. If for some reason the start-up cannot be completed the program will be rescheduled and the system will be run to the satisfaction of the Engineer at no additional cost to the Owner. The entire cost of the start-up program shall be included in the contract.
- B. Contractor shall use attached forms for major pieces of equipment. It is the School Districts requirement all information be filled in prior to acceptance of project.

3.6 OPERATING AND MAINTENANCE MANUALS:

- 1. Three binders shall be submitted to mechanical consultant. Consultant shall review and approve then submit the 3 copies to the owner.
- 2. Operating and maintenance manuals shall include the following systems:
 - a. Mechanical systems
 - b. Plumbing systems
 - c. Fire protection systems
 - d. Energy/management control systems (EMCS)

3. All components specified and/or scheduled of the above systems shall require O&M manuals and shall be identified according to the specifications and/or schedule identification mark/label.
4. Basic information required for O&M manuals:
 - a. Operating routines and procedures:
 - Control sequences
 - Temperature set points
 - Control diagrams
 - Ventilation requirements
5. Start-up and shut-down procedures i.e. checklist for start-up/shut-down
 - a. Equipment/fixture specific information
 - Identification mark/label
 - Manufacturer name
 - Model #
 - Etc.
 - b. Trouble shooting section
 - c. Preventive maintenance program including frequency of actions
 - d. Scheduled maintenance programs including frequency of actions
 - e. Parts lists with local vendors (multiple if available)
6. Manuals shall be submitted and approved by mechanical consultant prior to substantial completion acceptance.

3.7 SHOP DRAWINGS

Submit shop drawings on all equipment.

END OF SECTION 230000

**SECTION 23 05 93
TEST AND BALANCE**

PART I - GENERAL

1.1 SCOPE

- A. This section covers the testing and balancing of environmental system including but not limited to: air distribution systems, hydronic distribution system and the equipment and apparatus connected thereto.
- B. The work required herein shall consist of setting volume (flow) and speed adjusting facilities provided or specified for the systems, recording data, making tests and preparing reports, all as hereinafter specified.

1.2 GENERAL REQUIREMENTS

- A. The work described in this section shall be performed by a firm(s) certified by the National Environmental Balancing Bureau. If the Installing Contractor is not certified by the NEBB, he shall submit appropriate data indicating experience and qualifications.

PART 2 - PROCEDURE

2.1 PROCEDURES

- A. The environmental systems including all equipment, apparatus and distribution system shall be tested and balanced in accordance with the NEBB "Procedural Standards for Testing Adjusting and Balancing of Environmental Systems" published by the NEBB, Current Edition.
- B. All work performed under this section shall be under the direction of the supervisor who is designated and qualified under the certification requirements of NEBB.
- C. All instruments used for measurement shall be accurate, and calibration histories for each instrument shall be available for examination. Calibration and maintenance of all instruments shall be in accordance with the requirements of NEBB.
- D. Accuracy of measurement shall be in accordance with NEBB standards.
- E. General Information

1. The Testing, Adjusting, and Balancing (TAB) Contractor shall be independent from the controls contractor and equipment sales representative for the specific construction project.
2. The contractor shall test adjust and balance the following mechanical systems.
 - a. Supply air systems
 - b. Return air systems
 - c. Exhaust air systems
 - d. Chilled water systems
 - e. Heating water systems
 - f. Verify energy management control systems (EMCS)
3. A certified NEBB or AABC TAB supervisor must be onsite at all times during TAB work to completely oversee the testing, adjusting, and balancing of the system.
4. A pre-balance conference shall take place between the mechanical engineer, mechanical contractor, controls contractor, electrical contractor and possibly the owners representative prior to beginning of the testing, balancing and adjusting. Discussion shall focus on the verification that the system is ready for TAB work.
5. TAB work shall be completed with final report prior to the completion of the pre-punch checklist for equipment.
6. Field reports shall be issued to mechanical contractor and mechanical consultant directly from TAB contractor regarding deficiencies in the system that prevent proper TAB work as well as proper system operation.
7. Preliminary and final reports shall be outlined by mechanical consultant regarding submission of data and formatting requirements.
8. Calibration of instruments and balancing tolerances to be outlined by mechanical consultant.
9. Preliminary data shall include the following information with deficiencies reported on field reports.

F. AIR SYSTEM BALANCING

1. Review design drawings and specifications and become thoroughly acquainted with the design intent.

2. Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.
3. Check filters for cleanliness.
4. Check dampers for correct and locked position, and temperature control for completeness of installation before starting fans.
5. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a cross-check with required fan volumes.
6. Determine best locations in main and branch ductwork for most accurate duct traverses.
7. Place outlet dampers in the full open position.
8. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
9. Verify that all motors and bearings are lubricated.
10. Verify that Volume, fire and smoke dampers are properly installed and functional.
11. Verify that supply, return exhaust and transfer grilles, registers, diffusers, terminal units with controls and filters are installed properly.
12. Verify that air handling systems, units, duct systems and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc. are correctly blanked and/or sealed to eliminate by-pass or leakage of air.
13. Verify that fans operating at full load and verify for freedom vibration, proper fan rotation and belt tension and those elements in motor starters to be of proper size and rating.
14. Verify proper installation of duct mounted smoke detectors.
15. Verify that mixing boxes set to maximum, minimum and outlets balanced within 10% of design CFM.
16. With supply system in maximum mode, proportion return inlets, traverse and adjust dampers to design cfm. Re-measure and adjust return inlets within 10% of design cfm. Record all final traverse and static pressure data.
17. With supply system in the maximum mode, adjust minimum outside air damper to design through pitot tube traverse. Measure and record traverse and static pressure.
18. After completion, take total air handling unit static profile and record all final statics, amperage rpm, cfm, etc.

G. CONTROL SYSTEMS

1. Verify that control components are installed in accordance with project requirements and functional, including electrical interlocks, damper

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sequences, air and water resets, fire and freeze stats, temperature/humidity sensors and high and low limit switches.

2. Thermostats and Controllers:
 - a. Check for proper control valves, mixing boxes, exhaust fans, etc.
 - b. Determine calibration set point of all thermostats.
 - c. Set design set point.
3. DDC Control System: Verify all the schedule control points are actually included and operating; the control contractor should submit a trend report once system is completed. Provide written report verifying that DDC control system is fully functional.

J. FUME HOODS

1. Verify fume hood operation using ASHRAE 110 standard.

PART 3 - EXECUTION

3.1 REPORTS

- A. Four copies of the final reports shall be submitted on applicable Reporting Forms for review.
- B. Each individual final Reporting Form submitted must bear the signature of the person who recorded the data and the signature of the TAB supervisor of the performing firm. Identification of all types of instruments used and their last dates of calibration will be submitted with the final report.

3.2 GUARANTEE

- A. The NEBB certified firm guarantees that all testing and balancing work will be performed in accordance with NEBB standards and procedures and shall provide evidence of their certification for the Engineer or designated Owner's representative.

END OF SECTION 23 05 93

SECTION 230900
ENERGY MANAGEMENT SYSTEM (EMS)

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. Refer to Section 220500

1.2 WORK DESCRIPTION

- A. Scope: This section contains general requirements for the supply and installation of a microprocessor based Energy Management System (EMS) as an extension of the existing system
- B. Controls Contractor shall be responsible for furnishing and installing all equipment and wiring for Building Automation Systems (Temperature and HVAC Equipment Control) for a complete and operable system as specified herein. All wiring shall be done in accordance with all local and national codes.
- C. Work Included: It is the intent of this specification for the EMS to be installed as a complete package by Existing Controls Contractor. The system shall include all computer software and hardware, controllers, sensors, transmission equipment, local panels, installation, engineering, supervision, commissioning, acceptance test, training, and warranty service.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Products furnished, but not installed under this section include air flow stations, automatic dampers, valves, flow switches, flow sensors, thermowells and pressure taps to be installed by the Mechanical Contractor.
- B. Coordination with electrical:
1. Installation of all line voltage power wiring including 120V power to each terminal unit and DDC panel by Division 16.
 2. Each motor starter provided under Division 15 or 16, shall be furnished with individual control power transformer to supply 120 volt control power and auxiliary contacts (one N.O. and one N.C.) for use by this section.

1.4 QUALIFICATIONS

- A. System components shall be provided by Control and Equipment.

- B. The control system shall be furnished, engineered and installed by a branch office having factory trained technicians to provide instruction, routine maintenance, and emergency service within 24 hours upon receipt of request.
- C. The control system components shall be new and in conformance with the following applicable standards for products specified:
 - 1. American Society for Testing and Materials, ASTM
 - 2. Institute of Electrical and Electronic Engineers, IEEE
 - 3. National Electrical Manufacturers Association, NEMA
 - 4. Underwriters Laboratory, UL (UL 916 & 864)
 - 5. FCC Regulation, Part 15, Section 156
 - 6. National Fire Protection Association, NFPA
 - 7. Local Building Codes

1.5 SUBMITTALS

- A. The controls contractor shall submit Auto CAD generated schematic drawings for the entire system for review and approval before work shall begin. Included in the submittal drawings shall be a one page diagram depicting the system architecture complete with a communications riser. Drawings shall include point-to-point wiring diagrams and any special connection information required for properly controlling the equipment. The submittal shall include a bill of material reference list as well as equipment sequences of operation.
- B. The submittals shall include the manufacturer's catalog data describing, highlighting and specifically indicating each item of equipment or component provided and installed for the project.

1.6 PROTECTION OF SOFTWARE RIGHTS

- A. Prior to delivery of software, the Owner and the party providing the software will enter into a software license agreement with provisions for the following:
 - 1. Limiting use of software to equipment provided under these Specifications.
 - 2. Limiting copying.
 - 3. Preserving confidentiality.
 - 4. Prohibiting transfer to a third party.

PART 2 - PRODUCTS

2.1 ACCEPTIBLE BIDDERS

- A. The specifications are intended to describe the microprocessor based Energy Management System –

2.2 NETWORKING

- A. The design of the EMS shall network operator workstations and stand-alone DDC Controllers. The network architecture shall consist of three levels, a campus-wide (Management Level Network - MLN) Ethernet network based on TCP/IP protocol, high performance peer-to-peer Building Level Network (BLN) and Application Specific Controller Floor Level Networks (FLN) with access being totally transparent to the user when accessing data or developing control programs.
- B. The design of EMS shall allow the co-existence of new DDC Controllers with existing DDC Controllers in the same network without the use of gateways or protocol converters.
- C. All operator devices either network resident or connected via dial-up modems shall have the ability to access all point status and application report data or execute control functions for any and all other devices via the peer-to-peer network. No hardware or software limits shall be imposed on the number of devices with global access to the network data at any time.
- D. A single Workstation shall support a minimum of four (4) Building Level Networks (BLN). The BLN's can be any combination of direct or modem connected Networks. All Networks shall be dynamically connected to allow access to points on different BLN's simultaneously.

2.3 APPLICATION SPECIFIC CONTROLLERS

A. TERMINAL EQUIPMENT CONTROLLERS (TEC)

- 1. Provide for control of each piece of equipment, including, but not limited to, the following:
 - a) VAV and CAV Dual Duct Boxes
 - b) VAV Terminal Units with and without heating coils
 - c) Fan Coil Units
- 2. The controllers shall include all inputs and outputs necessary to perform the specified control sequences. Analog outputs shall 24 volt floating.
- 3. Each controller performing space temperature control shall be provided with a matching room temperature sensor with a setpoint adjustment between 55 °F and 95°F.
- 4. Each room temperature sensor shall include a terminal jack integral to the sensor assembly. The terminal jack shall be used to connect a portable operator's terminal to control and monitor all hardware and software points associated with the respective controller.

5. Setpoint adjustment and override function shall have the ability to be locked out, overridden, or limited as to time or temperature through software by an authorized operator at the central workstations, at the DDC Controller, or via the portable operator's terminal.
6. Each controller shall perform its primary control function independent of the DDC Controller. The controller shall receive its real-time data from the DDC Controller time clock. Each controller shall include algorithms incorporating proportional, integral, and derivative (PID) gains for all applications. All PID gains and biases shall be adjustable by the user via terminals as specified herein. This functionality shall allow for tighter control and shall facilitate optimal occupant comfort and energy savings.
7. Provide each terminal equipment controller with sufficient memory to accommodate point databases and operating programs. All databases and programs shall be stored in non-volatile EEPROM, EPROM, and PROM. The controllers shall be able to return to full normal operation without user intervention after a power failure. Operating programs shall be selectable and may be modified to meet the user's exact control strategy requirements, allowing for additional system flexibility:
8. Controllers shall be powered from a 24 VAC source, and shall function normally under an operating range of 18 to 28 VAC (-25% to +17%), allowing for power source fluctuations and voltage drops. The controllers shall also function normally under ambient conditions of 32 Degrees to 122 Degree F and 10-95% RH (non-condensing). Provide each controller with a suitable cover or enclosure to protect the intelligence board assembly.
9. Pressure independent controllers shall include differential pressure transducers that shall connect to the terminal unit manufacturer's standard averaging air velocity sensor to measure the average differential pressure in the duct. The controller shall convert this value to actual airflow. The differential pressure transducer shall have a measurement range of 400 to 4,000 FMP and measurement accuracy of +/-5% at 400 FPM insuring primary air flow condition shall be controlled and maintained to within +/-5% of setpoint at the specified parameters. Each controller shall include provisions for manual and automatic calibration of the differential pressure transducer in order to maintain stable control and insuring against drift overtime. The controller requiring 24 hours a day operation shall calibrate the airflow sensor every 24 hours with the use of an auto-zero module to eliminate the requirement of closing the supply damper to calibrate the flow sensor. It shall not be necessary to remove the controller to remove the damper actuator.

2.4 WORKSTATION

- A. The existing Personal computer operator workstations shall control the new extension.

2.5 WORKSTATION SOFTWARE

- A. No additional interface software shall be required.

PART 3 - EXECUTION

3.1 PROJECT MANAGEMENT

- A. Provide a project manager who shall, as a part of his duties, be responsible for the following activities:
1. Coordination between this Contractor and all other trades, Owner, local authorities and the design team.
 2. Scheduling of manpower, material delivery, equipment installation and checkout.
 3. Maintenance of construction records such as project scheduling and manpower planning and Auto CAD for project coordination and as-built drawings.

3.2 INSTALLATION METHODS

A. Electrical Wiring

1. Install systems and materials in accordance with manufacturer's instructions, rough-in drawings and equipment details. Install electrical components and use electrical products complying with requirements of applicable Division 16 Sections of these Specifications except where specifically stated in this Section.
2. The term "control wiring" is defined to include providing of wire, conduit, and miscellaneous material as required for mounting and connecting electric or electronic control devices.
3. Install all control wiring in conduit for electric/electronic control systems. Conceal wiring, except in mechanical rooms and areas where other conduit and piping are exposed. UL plenum rated cable shall be allowable above accessible lift out ceiling, in air plenums, and in other areas as approved by local and NEC codes.
4. Wall sensors shall be installed on electrical "J" boxes and conduit stubbed to above lift out ceilings. Plastic bushing shall be installed where the sensor wire exits the conduit to prevent damage.
5. Number-code or color-code conductors, excluding those used for individual zone controls, appropriately for future identification and servicing of control system.
6. This section shall provide all line voltage power wiring required because of substitution of equipment specified in this section.
7. Division 16 shall provide 120 volt power to all DDC Controllers specified in paragraph 2.3 of this Section.

3.3 SYSTEM ACCEPTANCE

- A. General: The system installation shall be complete and tested for proper operation prior to acceptance testing for the Owner's authorized representative. A letter shall be submitted to the Architect requesting system acceptance. This letter shall certify all controls are installed and the software programs have been completely exercised for proper equipment operation. Acceptance testing will commence at a mutually agreeable time within ten (10) calendar days of request. When the field test procedures have been demonstrated to the Owner's representative, the system will be accepted. The warranty period will start at this time.
- B. Field Equipment Test Procedures: DDC control panels shall be demonstrated via a functional end-to-end test. Such that:
1. All output channels shall be commanded (on/off, stop/start, adjust, etc.) and their operation verified.
 2. All analog input channels shall be verified for proper operation.
 3. Changing the state of the field device and observing the appropriate change of displayed value shall verify all digital input channels.
 4. If a point should fail testing, perform necessary repair action and retest failed point and all interlocked points.
 5. Introducing an error into the system and observing the proper corrective system response shall verify automatic control operation.
 6. Changing the schedule and observing the correct response on the controlled outputs shall verify selected time and setpoint schedules.
- C. Workstation Test Procedures: The system workstation test procedures shall be as follows:
1. Communication with each DDC control panel shall be demonstrated.
 2. Operator commands will be explained and demonstrated.
 3. Control sequences shall be demonstrated for proper operation.
 4. All available system reports and logs shall be demonstrated at the system workstation.
 5. Correct system start-up and shutdown procedures shall be demonstrated.
 6. All controllers shall be demonstrated to operate in a standalone mode.

- D. Record Documentation: After a successful acceptance demonstration, the Contractor shall submit as-built drawings of the completed project for final approval. After receiving final approval, supply "6" complete 11 x 17 as-built drawings sets.
- E. Operation and Maintenance Manuals: Submit three copies of operation and maintenance manuals. Include the following:
 - 1. Manufacturer's catalog data and specifications on sensors, transmitters, controllers, control valves, damper actuators, gauges, indicators, terminals and any miscellaneous components used in the system.
 - 2. An operator's manual that will include detailed instructions for all operations of the system.
 - 3. An operator's reference table listing the addresses of all connected input points and output points. Settings shall be shown where applicable.
 - 4. A programmer's manual that will include all information necessary to perform programming functions.
 - 5. A language manual that will include a detailed description of the language used and all routines used by the system.
 - 6. Complete program listing file and parameter listing file for all programs.
 - 7. A copy of the warranty.
 - 8. Operating and maintenance cautions and instructions.
 - 9. Recommended spare parts list.

3.4 SERVICE AND GUARANTEE

- A. This system specified under this Section of the Specifications shall be guaranteed from defects in workmanship and material under normal use and service for a period of twelve (12) months from the date of acceptance. If, during the one year period, any of the factory equipment or materials provided in the system is found to be defective in materials or workmanship, it shall be replaced or repaired by the DDC Manufacturer at no additional cost to the Owner.
- B. Upon completion of the installation, the Contractor shall thoroughly inspect, check, adjust, calibrate, and make ready for use all devices/sensors comprising the control system and certify that they are installed in accordance with "Record" Drawings.

END OF SECTION

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Copper building wire.
 - 2. Metal-clad cable, Type MC.
 - 3. Connectors and splices.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: Indicate type, use, location, and termination locations.

1.03 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.01 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Encore Wire Corporation.
 - 2. Okonite Company (The).
 - 3. Southwire Company, LLC.
- C. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- E. Conductor Insulation:
 - 1. Type THHN and Type THWN-2: Comply with UL 83.

2.02 METAL-CLAD CABLE, TYPE MC

- A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Belden Inc.
 - 2. Okonite Company (The).
 - 3. Southwire Company, LLC.
- C. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. Comply with UL 1569.
 - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Circuits:
 - 1. Single circuit.
- E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- F. Ground Conductor: Insulated
- G. Conductor Insulation:
 - 1. Type TFN/THHN/THWN-2: Comply with UL 83.
 - 2. Type XHHW-2: Comply with UL 44.
- H. Armor: Steel, interlocked.
- I. Jacket: PVC applied over armor.

2.03 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M Electrical Products.
 2. ILSCO.
 3. Ideal Industries, Inc.
 4. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
1. Material: Copper.
 2. Type: One hole with standard barrels.
 3. Termination: Compression.

PART 3 - EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders:
1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
 2. Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors must be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits:
1. Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
 2. Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- C. ASD Output Circuits Cable: Extra-flexible stranded for all sizes.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- B. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- D. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.03 INSTALLATION, GENERAL

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.04 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 10 inch of slack.

3.05 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.07 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.08 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
 - 2. Perform each of the following visual and electrical tests:
 - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
 - b. Test bolted connections for high resistance using one of the following:
 - 1) A low-resistance ohmmeter.
 - 2) Calibrated torque wrench.
 - 3) Thermographic survey.
 - c. Inspect compression-applied connectors for correct cable match and indentation.
 - d. Inspect for correct identification.
 - e. Inspect cable jacket and condition.
 - f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable for a one-minute duration.
 - g. Continuity test on each conductor and cable.
 - h. Uniform resistance of parallel conductors.
 - 3. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
 - a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - b. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- B. Cables will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports to record the following:
 - 1. Procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.03 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.02 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B3.
 - 2. Stranded Conductors: ASTM B8.
 - 3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.

2.03 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

- B. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- C. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- D. Conduit Hubs: Mechanical type, terminal with threaded hub.
- E. Straps: Solid copper, copper lugs. Rated for 600 A.
- F. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

PART 3 - EXECUTION

3.01 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Grounding Conductors: Green-colored insulation with continuous yellow stripe.
- C. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Connections to Structural Steel: Welded connectors.

3.02 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Metal-clad cable runs.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

3.03 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- C. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

3.04 FIELD QUALITY CONTROL

- A. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
- B. Grounding system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
- E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Support, anchorage, and attachment components.
2. Fabricated metal equipment support assemblies.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Slotted support systems, hardware, and accessories.
 - b. Clamps.
 - c. Hangers.
 - d. Sockets.
 - e. Eye nuts.
 - f. Fasteners.
 - g. Anchors.
 - h. Saddles.
 - i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.

C. Delegated Design Submittal: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.
2. Include design calculations for seismic restraints.

1.03 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified structural professional engineer to design hanger and support system.

2.02 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Allied Tube & Conduit; Atkore International.
 - b. CADDY; brand of nVent Electrical plc.
 - c. Unistrut; Atkore International.
 - 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 3. Material for Channel, Fittings, and Accessories: Galvanized steel.
 - 4. Channel Width: Selected for applicable load criteria.
 - 5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs must have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body must be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by the following:

- 1) Hilti, Inc.
2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
5. Toggle Bolts: All Stainless steel springhead type.
6. Hanger Rods: Threaded steel.

2.03 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.01 SELECTION

- A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 1. NECA NEIS 101
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceway and Boxes for Electrical Systems."
- D. Provide seismic controls with hangers and supports in accordance with requirements specified in "Section 260548.16 "Seismic Controls for Electrical Systems."
- E. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERM as required by NFPA 70. Minimum rod size must be 1/4 inch in diameter.
- F. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with single-bolt conduit clamps.
- G. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2 inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.02 INSTALLATION OF SUPPORTS

- A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination must be weight of supported components plus 200 lb.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M. Submit welding certificates.

3.04 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inch larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000 psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base as follows:
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.05 PAINTING

- A. Touchup:
 1. Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - a. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
 2. Comply with requirements in Section 099113 "Exterior Painting" Section 099123 "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION

SECTION 260533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Type EMT-S raceways and elbows.
 - 2. Type EPEC raceways and fittings.
 - 3. Type ERMCS raceways, elbows, couplings, and nipples.
 - 4. Type FMC-S raceways.
 - 5. Type FMT raceways.
 - 6. Type IMC raceways.
 - 7. Type LFMC raceways.
 - 8. Type PVC raceways and fittings.
 - 9. Fittings for conduit, tubing, and cable.
 - 10. Threaded metal joint compound.
 - 11. Surface metal raceways and fittings.
 - 12. Wireways and auxiliary gutters.
 - 13. Metallic outlet boxes, device boxes, rings, and covers.
 - 14. Termination boxes.
 - 15. Cabinets, cutout boxes, junction boxes, pull boxes, and miscellaneous enclosures.
 - 16. Cover plates for device boxes.
 - 17. Hoods for outlet boxes.

1.02 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Wireways and auxiliary gutters.
 - 2. Surface metal raceways.
 - 3. Floor boxes.
 - 4. Cabinets, cutout boxes, and miscellaneous enclosures.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details. Show that floor boxes are located to avoid interferences and are structurally allowable. Indicate floor thickness where boxes are embedded in concrete floors and underfloor clearances where boxes are installed in raised floors.
- C. Samples: For wireways, surface raceways, and floor boxes for colors and textures specified, 12 inch long.

1.03 INFORMATIONAL SUBMITTALS

- A. Manufacturers' Instructions:
 - 1. For Type ERMCS-PVC.

PART 2 - PRODUCTS

2.01 TYPE EMT-S RACEWAYS AND ELBOWS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL 797 and UL Category Control Number FJMX.
- B. Steel Electrical Metal Tubing (EMT-S) and Elbows:
 - 1. Material: Steel.
 - 2. Options:
 - a. Exterior Coating: Zinc.
 - b. Interior Coating: Zinc with organic top coating.
 - c. Minimum Trade Size: Metric designator 16 (trade size 1/2).

2.02 TYPE EPEC RACEWAYS AND FITTINGS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL 651A and UL Category Control Number EAZX.
- B. Schedule 40 Electrical HDPE Underground Conduit (EPEC-40):
 - 1. Dimensional Specifications: Schedule 40.
 - 2. Options:
 - a. Minimum Trade Size: Metric designator 16 (trade size 1/2).

2.03 TYPE ERM-C-S RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL 6 and UL Category Control Number DYIX.
- B. Galvanized-Steel Electrical Rigid Metal Conduit (ERM-C-S-G), Elbows, Couplings, and Nipples:
 - 1. Exterior Coating: Zinc.
 - 2. Options:
 - a. Interior Coating: Zinc with organic top coating.
 - b. Minimum Trade Size: Metric designator 16 (trade size 1/2).
 - c. Colors: As indicated on Drawings.

2.04 TYPE FMC-S AND TYPE FMC-A RACEWAYS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL 1 and UL Category Control Number DXUZ.
- B. Steel Flexible Metal Conduit (FMC-S):
 - 1. Material: Steel.
 - 2. Options:
 - a. Minimum Trade Size: Metric designator 16 (trade size 1/2).
 - b. Colors: As indicated on Drawings.

2.05 TYPE FMT RACEWAYS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL 1652 and UL Category Control Number ILJW.
- B. Steel Flexible Metallic Tubing (FMT):
 - 1. Options:
 - a. Minimum Trade Size: Metric designator 16 (trade size 1/2).
 - b. Colors: As indicated on Drawings.

2.06 TYPE IMC RACEWAYS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL 1242 and UL Category Control Number DYBY.
- B. Steel Electrical Intermediate Metal Conduit (IMC):
 - 1. Options:
 - a. Exterior Coating: Zinc.
 - b. Interior Coating: Zinc with organic top coating.
 - c. Minimum Trade Size: Metric designator 16 (trade size 1/2).
 - d. Colors: As indicated on Drawings.

2.07 TYPE LFMC RACEWAYS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

2. General Characteristics: UL 360 and UL Category Control Number DXHR.

B. Steel Liquidtight Flexible Metal Conduit (LFMC-S):

1. Material: Steel.
2. Options:
 - a. Minimum Trade Size: Metric designator 16 (trade size 1/2).
 - b. Colors: As indicated on Drawings.

2.08 TYPE PVC RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 651 and UL Category Control Number DZYR.

B. Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Dimensional Specifications: Schedule 40.
2. Options:
 - a. Minimum Trade Size: Metric designator 16 (trade size 1/2).
 - b. Markings: For use with maximum 90 deg C wire.

2.09 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

B. Fittings for Type ERM, Type IMC, Type PVC, Type EPEC, and Type RTRC Raceways:

1. General Characteristics: UL 514B and UL Category Control Number DWTT.
2. Options:
 - a. Material: Steel.
 - b. Coupling Method: Compression coupling.
 - c. Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
 - d. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

C. Fittings for Type EMT Raceways:

1. General Characteristics: UL 514B and UL Category Control Number FKAV.
2. Options:
 - a. Material: Steel.
 - b. Coupling Method: Compression coupling.
 - c. Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
 - d. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

D. Fittings for Type FMC Raceways:

1. General Characteristics: UL 514B and UL Category Control Number ILNR.

- E. Fittings for Type LFMC and Type LFNC Raceways:
 - 1. General Characteristics: UL 514B and UL Category Control Number DXAS.

2.10 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL 2419 and UL Category Control Number FOIZ.

2.11 SURFACE METAL RACEWAYS AND FITTINGS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL 5 and UL Category Control Number RJBT.
- B. Surface Metal Raceways and Fittings with Metal Covers:
 - 1. Options:
 - a. Galvanized steel base with snap-on covers.
 - b. Manufacturer's standard enamel finish in color selected by Architect.
 - c. Wiring Channels: Dual. Multiple channels must be capable of housing a standard 20 to 30 A NEMA device flush within the raceway.
- C. Surface Metal Raceways and Fittings with Nonmetallic Covers:
 - 1. Additional Characteristics: UL 94, V-0 requirements for self-extinguishing characteristics.
 - 2. Options:
 - a. Aluminum base with snap-on covers.
 - b. Provide texture and color selected by Architect from manufacturer's standard colors.
 - c. Wiring Channels: Dual. Multiple channels must be capable of housing a standard 20 to 30 A NEMA device flush within the raceway.

2.12 WIREWAYS AND AUXILIARY GUTTERS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL 870 and UL Category Control Number ZOYX.
- B. Metal Wireways and Auxiliary Gutters:
 - 1. Additional Characteristics:

- a. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
 - b. Finish: Manufacturer's standard enamel finish.
2. Options:
- a. Degree of Protection: Type 1 unless otherwise indicated.
 - b. Wireway Covers: Hinged type unless otherwise indicated.

2.13 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Performance Criteria:

- 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- 2. General Characteristics: UL 514A and UL Category Control Number QCIT.

B. Metallic Outlet Boxes:

- 1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
- 2. Options:
 - a. Material: Sheet steel.
 - b. Sheet Metal Depth: Minimum 2.5 inch 2.8 inch.
 - c. Cast-Metal Depth: Minimum 2.4 inch.
 - d. Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb.
 - e. Paddle Fan Outlet Boxes and Covers: Nonadjustable, designed for attachment of paddle fan weighing up to 70 lb.

C. Metallic Conduit Bodies:

- 1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.

D. Metallic Device Boxes:

- 1. Description: Box with provisions for mounting wiring device directly to box.
- 2. Options:
 - a. Material: Sheet steel and Cast metal.
 - b. Sheet Metal Depth: minimum 2.8 inch.
 - c. Cast-Metal Depth: minimum 2.4 inch.

E. Metallic Extension Rings:

- 1. Description: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both.

F. Metallic Floor Boxes and Floor Box Covers:

1. Description: Box mounted in floor with floor box cover and other components to complete floor box enclosure.

G. Metallic Concrete Boxes and Covers:

1. Description: Box intended for use in poured concrete.

2.14 TERMINATION BOXES

A. Description: Enclosure for termination base consisting of lengths of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors or both.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 1773 and UL Category Control Number XCKT.

C. Termination Boxes and Termination Bases for Installation on Line Side of Service Equipment:

1. Additional Characteristics: Listed and labeled for installation on line side of service equipment.

D. Termination Boxes and Termination Bases for Installation on Load Side of Service Equipment:

1. Additional Characteristics: Listed and labeled for installation on load side of service equipment.

2.15 CABINETS, CUTOUT BOXES, JUNCTION BOXES, PULL BOXES, AND MISCELLANEOUS ENCLOSURES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics:
 - a. Non-Environmental Characteristics: UL 50.
 - b. Environmental Characteristics: UL 50E.

B. Indoor Sheet Metal Cabinets:

1. Description: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
2. Additional Characteristics: UL Category Control Number CYIV.
3. Options:
 - a. Degree of Protection: Type 1 and Type 12.

C. Indoor Sheet Metal Cutout Boxes:

1. Description: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.
2. Additional Characteristics: UL Category Control Number CYIV.
3. Options:

a. Degree of Protection: Type 1.

D. Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Additional Characteristics: UL Category Control Number BGUZ.
3. Options:

a. Degree of Protection: Type 1.

E. Indoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Additional Characteristics: UL Category Control Number BGUZ.
3. Options:

a. Degree of Protection: Type 1.

F. Indoor Sheet Metal Miscellaneous Enclosures:

1. Additional Characteristics: UL 1773 and UL Category Control Number XCKT.
2. Options:

a. Degree of Protection: Type 1.

G. Outdoor Sheet Metal Cabinets:

1. Description: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
2. Additional Characteristics: UL Category Control Number CYIV.
3. Options:

a. Degree of Protection: Type 3R.

H. Outdoor Sheet Metal Cutout Boxes:

1. Description: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.
2. Additional Characteristics: UL Category Control Number CYIV.
3. Options:

a. Degree of Protection: Type 3R.

I. Outdoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Additional Characteristics: UL Category Control Number BGUZ.

- 3. Options:
 - a. Degree of Protection: Type 3R.

J. Outdoor Polymeric Junction and Pull Boxes:

- 1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
- 2. Additional Characteristics: UL Category Control Number BGUZ.
- 3. Options:
 - a. Degree of Protection: Type 3R.

K. Outdoor Sheet Metal Miscellaneous Enclosures:

- 1. Additional Characteristics: UL 1773 and UL Category Control Number XCKT.
- 2. Options:
 - a. Degree of Protection: Type 3R.

2.16 COVER PLATES FOR DEVICES BOXES

A. Performance Criteria:

- 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- 2. General Characteristics:
 - a. Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.
 - b. Wallplate-Securing Screws: Metal with head color to match wallplate finish.

B. Metallic Cover Plates for Device Boxes:

- 1. Options:
 - a. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
 - b. Wallplate Material: 0.032 inch thick Type 302/304 non-magnetic stainless steel with brushed finish.

2.17 HOODS FOR OUTLET BOXES

A. Performance Criteria:

- 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- 2. General Characteristics:
 - a. Reference Standards:
 - 1) UL 514D and UL Category Control Numbers QCIT and QCMZ.

- 2) Receptacle, hood, cover plate, gaskets, and seals comply with UL 498 Supplement SA when mated with box or enclosure complying with UL 514A, UL 514C, or UL 50E.
- b. Mounts to box using fasteners different from wiring device.
- B. Extra-Duty, While-in-Use Hoods for Outlet Boxes:
 - 1. Additional Characteristics: Marked "Extra-Duty" in accordance with UL 514D.
 - 2. Options:
 - a. Provides gray, weatherproof, "while-in-use" cover.
 - b. Manufacturer may combine nonmetallic device box with hood as extra-duty rated assembly.

PART 3 - EXECUTION

3.01 SELECTION OF RACEWAYS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of raceways. Consult Architect for resolution of conflicting requirements.
- B. Outdoors:
 - 1. Exposed and Subject to Severe Physical Damage: ERM C.
 - 2. Exposed and Subject to Physical Damage: ERM C.
 - a. Locations less than 2.5 m (8 ft) above finished floor.
 - 3. Exposed and Not Subject to Physical Damage: ERM C.
 - 4. Concealed Aboveground: EMT.
 - 5. Direct Buried: PVC-40.
 - 6. Concrete Encased Not in Trench: PVC-40.
 - 7. Concrete Encased in Trench: PVC-40.
 - 8. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
- C. Indoors:
 - 1. Hazardous Classified Locations: ERM C.
 - 2. Exposed and Subject to Severe Physical Damage: ERM C. Subject to severe physical damage includes the following locations:
 - a. Loading docks.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - 3. Exposed and Subject to Physical Damage: ERM C. Subject to physical damage includes the following locations:
 - a. Locations less than 2.5 m (8 ft) above finished floor.
 - b. Stub-ups to above suspended ceilings.

4. Exposed and Not Subject to Physical Damage: ERM C.
 5. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 6. Damp or Wet Locations: ERM C.
 7. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
- D. Raceway Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
1. ERM C and IMC: Provide threaded type fittings unless otherwise indicated.

3.02 SELECTION OF BOXES AND ENCLOSURES

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.
- B. Degree of Protection:
1. Outdoors:
 - a. Type 3R unless otherwise indicated.
 - b. Locations Exposed to Hosedown: Type 4.
 - c. Locations Subject to Potential Flooding: Type 6P.
 - d. Locations in-Ground or Exposed to Corrosive Agents: Type 4X.
 2. Indoors:
 - a. Type 1 unless otherwise indicated.
 - b. Damp or Dusty Locations: Type 12.
 - c. Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
 - d. Locations Exposed to Hosedown: Type 4.
 - e. Locations Exposed to Corrosive Agents: Type 4X.
 - f. Locations Exposed to Spraying Oil or Coolants: Type 13.
- C. Exposed Boxes Installed Less Than 2.5 m (8 ft) Above Floor:
1. Boxes with knockouts or unprotected openings are prohibited.
 2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.03 INSTALLATION OF RACEWAYS

- A. Installation Standards:
1. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for installation of raceways. Consult Architect for resolution of conflicting requirements.
 2. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
 3. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

4. Comply with NECA NEIS 101 for installation of steel raceways.
5. Install raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
6. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
7. Raceway Terminations at Locations Subject to Moisture or Vibration:
 - a. Provide insulating bushings to protect conductors, including conductors smaller than No. 4 AWG. Install insulated throat metal grounding bushings on service conduits.

B. General Requirements for Installation of Raceways:

1. Complete raceway installation before starting conductor installation.
2. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft above finished floor.
3. Install no more than equivalent of three 90-degree bends in conduit run except for control wiring conduits, for which no more than equivalent of two 90-degree fewer bends are permitted. Support within 12 inch of changes in direction.
4. Make bends in raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
5. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
6. Support conduit within 12 inch of enclosures to which attached.
7. Install raceway sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings in accordance with NFPA 70.
8. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of raceways at the following points:
 - a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - b. Where an underground service raceway enters a building or structure.
 - c. Conduit extending from interior to exterior of building.
 - d. Conduit extending into pressurized duct and equipment.
 - e. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
 - f. Where otherwise required by NFPA 70.
9. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
10. Keep raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
11. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
12. Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of

pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

C. Requirements for Installation of Specific Raceway Types:

1. Types ERM and IMC:

- a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

2. Types FMC and LFMC,:

- a. Comply with NEMA RV 3. Provide a maximum of 72 inch of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

3. Types PVC and EPEC:

- a. Do not install Type PVC or Type EPEC conduit where ambient temperature exceeds 122 deg F. Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
- b. Comply with manufacturer's written instructions for solvent welding and fittings.

D. Raceways Embedded in Slabs:

- 1. Run raceways larger than metric designator 27 (trade size 1) below concrete slab..
- 2. Arrange raceways to cross building expansion joints with expansion fittings at right angles to the joint.
- 3. Arrange raceways to ensure that each is surrounded by a minimum of 2 inch of concrete without voids.
- 4. Do not embed threadless fittings in concrete unless locations have been specifically approved by Architect.
- 5. Change from ENT to ERM before rising above floor.

E. Stub-ups to Above Recessed Ceilings:

- 1. Provide EMT, IMC, or ERM for raceways.
- 2. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

F. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

- 1. EMT: Provide compression, steel fittings. Comply with NEMA FB 2.10.
- 2. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

G. Expansion-Joint Fittings:

- 1. Install in runs of aboveground PVC that are located where environmental temperature change may exceed 30 deg F and that have straight-run length that exceeds 25 ft. Install in runs of aboveground ERM and EMT conduit that are located where environmental

- temperature change may exceed 100 deg F and that have straight-run length that exceeds 100 ft.
2. Install type and quantity of fittings that accommodate temperature change listed for the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 4. Install expansion fittings at locations where conduits cross building or structure expansion joints.
 5. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- H. Raceways Penetrating Rooms or Walls with Acoustical Requirements:
1. Seal raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.

3.04 INSTALLATION OF SURFACE RACEWAYS

- A. Install surface raceways only where indicated on Drawings.
- B. Install surface raceway with a minimum 2 inch radius control at bend points.
- C. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inch (mm) and with no less than two supports per straight raceway section. Support surface raceway in accordance with manufacturer's written instructions. Tape and glue are unacceptable support methods.

3.05 INSTALLATION OF BOXES AND ENCLOSURES

- A. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
- B. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- C. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.
- D. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

- E. Locate boxes so that cover or plate will not span different building finishes.
- F. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
- G. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
- H. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
- I. Set metal floor boxes level and flush with finished floor surface.
- J. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
- K. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:
 - 1. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
 - 2. Provide gaskets for wallplates and covers.

3.06 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.07 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

3.08 CLEANING

- A. Boxes: Remove construction dust and debris from device boxes, outlet boxes, and floor-mounted enclosures before installing wallplates, covers, and hoods.

END OF SECTION

SECTION 260544

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Round sleeves.
2. Rectangular sleeves.
3. Sleeve seal systems.
4. Grout.
5. Pourable sealants.
6. Foam sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.01 ROUND SLEEVES

A. Wall Sleeves, Steel:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - a. Advance Products & Systems, LLC;.
 - b. Flexicraft Industries;.
 - c. GPT; an EnPro Industries company;.
2. Description: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.

B. Wall Sleeves, Cast Iron:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - a. American Cast Iron Pipe Company.
 - b. Flexicraft Industries.
 - c. McWane Ductile.

2. Description: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.

C. Pipe Sleeves, PVC:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. CCI Piping Systems.
 - b. GPT; an EnPro Industries company.
 - c. Metraflex Company (The).
2. Description: ASTM D1785, Schedule 40.

D. Molded Sleeves, PVC:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. ABB, Electrification Business.
 - b. Arlington Industries, Inc.
 - c. Reliance Worldwide Corporation.
2. Description: With nailing flange for attaching to wooden forms.

E. Molded Sleeves, PE or PP:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Crete-Sleeve.
2. Description: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sheet Metal Sleeves, Galvanized Steel, Round:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Benefast.
 - b. Specified Technologies, Inc.
2. Description: Galvanized-steel sheet; thickness not less than 0.0239 inch; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.02 RECTANGULAR SLEEVES

A. Sheet Metal Sleeves, Galvanized Steel, Rectangular:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Specified Technologies, Inc.
 - b. Wiremold; Legrand North America, LLC.
2. Description:
 - a. Material: Galvanized sheet steel.
 - b. Minimum Metal Thickness:
 - 1) For sleeve cross-section rectangle perimeter less than 50 inch and with no side larger than 16 inch, thickness must be 0.052 inch.
 - 2) For sleeve cross-section rectangle perimeter not less than 50 inch or with one or more sides larger than 16 inch, thickness must be 0.138 inch.

2.03 SLEEVE SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. Advance Products & Systems, LLC.
 2. CALPICO, Inc.
 3. Proco Products, Inc.
- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.
 1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 2. Pressure Plates: Carbon steel.
 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.04 GROUT

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. W. R. Meadows, Inc.
- B. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
 1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
 2. Design Mix: 5000 psi, 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

2.05 POURABLE SEALANTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Carlisle Syntec Systems.
 - 2. GAF.
 - 3. Johns Manville; a Berkshire Hathaway company.
- B. Description: Single-component, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

2.06 FOAM SEALANTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Innovative Chemical Products (Building Solutions Group).
 - 2. The Dow Chemical Company.
- B. Description: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam. Foam expansion must not damage cables or crack penetrated structure.

PART 3 - EXECUTION

3.01 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4 inch annular clear space between sleeve and raceway or cable, unless sleeve seal system is to be installed or seismic criteria require different clearance.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inch above finished floor level. Install sleeves during erection of floors.

- B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for wall assemblies.
- C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seal systems. Size sleeves to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- E. Underground, Exterior-Wall and Floor Penetrations:
 - 1. Install steel pipe sleeves with integral waterstops. Size sleeves to allow for 1 inch annular clear space between raceway or cable and sleeve for installing sleeve seal system. Install sleeve during construction of floor or wall.
 - 2. Install steel pipe sleeves. Size sleeves to allow for 1 inch annular clear space between raceway or cable and sleeve for installing sleeve seal system. Grout sleeve into wall or floor opening.

3.02 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS

- A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.
- B. Install conduits and cable with no crossings within the sleeve.
- C. Fill opening around conduits and cables with expanding foam without leaving voids.
- D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

3.03 INSTALLATION OF SLEEVE SEAL SYSTEMS

- A. Install sleeve seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION

SECTION 260548

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Elastomeric isolation pads.
 - 2. Restraints - rigid type.
 - 3. Restraints - cable type.
 - 4. Restraint accessories.
 - 5. Post-Installed concrete anchors.
 - 6. Concrete inserts.
- B. Related Requirements:
 - 1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.02 DEFINITIONS

- A. OSHPD: Office of Statewide Health Planning and Development (for the State of California owned and regulated medical facilities).

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated load capacity for each seismic-restraint device.
 - 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - 3. Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by UL product listing.
 - 4. Annotate to indicate application of each product submitted and compliance with requirements.
- B. Shop Drawings:
 - 1. Detail fabrication and assembly of equipment bases.
 - 2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Delegated Design Submittal for Each Seismic-Restraint Device: Signed and sealed by qualified structural professional engineer.
 - 1. For each seismic-restraint device, including restraint - rigid and cable type, restraint accessory, and concrete anchor and insert that is required by this Section or is indicated on Drawings, submit the following:

- a. Seismic Restraints: Select seismic restraints complying with performance requirements, design criteria, and analysis data.
- b. Post-Installed Concrete Anchors and Inserts: Include calculations showing anticipated seismic loads. Include certification that device is approved by an NRTL for seismic reinforcement use.
- c. Seismic Design Calculations: Submit input data and loading calculations prepared under "Seismic Design Calculations" Paragraph in "Performance Requirements" Article.

1.04 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: UL product listing.
- B. Consequential Damage: Provide additional seismic restraints for suspended components or anchorage of floor-, roof-, or wall-mounted components so that failure of a non-essential or essential component will not cause failure of any other essential building component.
- C. Fire/Smoke Resistance: Seismic-restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL in accordance with ASTM E84 or UL 723, and be so labeled.
- D. Component Supports:
 - 1. Load ratings, features, and applications of reinforcement components must be based on testing standards of a nationally recognized testing agency.

2.02 ELASTOMERIC ISOLATION PADS

- A. Elastomeric Isolation Pads: .
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CADDY; brand of nVent Electrical plc.
 - b. Vibration Isolation.
 - 2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
 - 3. Size: Factory or field cut to match requirements of supported equipment.
 - 4. Pad Material: Oil and water resistant with elastomeric properties. Neoprene rubber, silicone rubber, or other elastomeric material.
 - 5. Surface Pattern: Smooth, ribbed, or waffle pattern.
 - 6. Infused nonwoven cotton or synthetic fibers.

7. Load-bearing metal plates adhered to pads.

2.03 RESTRAINTS - RIGID TYPE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. CADDY; brand of nVent Electrical plc.
- B. Description: Shop- or field-fabricated bracing assembly made of ANSI/AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.04 RESTRAINTS - CABLE TYPE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. CADDY; brand of nVent Electrical plc.
 2. VMC GROUP.
- B. Seismic-Restraint Cables: ASTM A1023/A1023M galvanized or ASTM A603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic-restraining cable service; with fittings attached by means of poured socket, swaged socket, or mechanical (Flemish eye) loop.
- C. Restraint cable assembly and cable fittings must comply with ASCE/SEI 19. Cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.05 RESTRAINT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. CADDY; brand of nVent Electrical plc.
 2. Hilti, Inc.
- B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Non-metallic stiffeners are unacceptable.
- C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings.
- D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

- F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.06 POST-INSTALLED CONCRETE ANCHORS

- A. Mechanical Anchor Bolts:
 - 1. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength for anchor and as tested according to ASTM E488/E488M.
- B. Adhesive Anchor Bolts:
 - 1. Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.
- C. Provide post-installed concrete anchors that have been prequalified for use in seismic and wind-load applications.
 - 1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
 - 2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.
- D. Expansion-type anchor bolts are not permitted for equipment in excess of 10 hp that is not vibration isolated.
 - 1. Undercut expansion anchors are permitted.

2.07 CONCRETE INSERTS

- A. Provide preset concrete inserts that are seismically prequalified in accordance with ICC-ES AC446 testing.
- B. Comply with MSS SP-58.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and equipment to receive seismic control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry static and seismic loads within specified loading limits.

3.03 INSTALLATION OF SEISMIC-RESTRAINT DEVICES

- A. Provide seismic restraint devices for systems and equipment where indicated in Equipment Schedules or Seismic and Wind-Load Controls Schedule, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.
 - 1. Install equipment and devices to withstand the effects of earthquake motions.
- B. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- C. Installation of seismic restraints must not cause any stresses, misalignment, or change of position of equipment or conduits.
- D. Equipment Restraints:
 - 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- E. Raceway, Cable, Wireway, and Cable Tray Restraints:
 - 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
 - 3. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 4. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- F. Install cables so they do not bend across edges of adjacent equipment or building structure.
- G. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- H. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- I. Post-Installed Concrete Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors must be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive-Type Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.04 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.05 FIELD QUALITY CONTROL

- A. Field tests must be witnessed by Architect and authorities having jurisdiction.
- B. Tests and Inspections:
 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice.
 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 4. Test no fewer than four of each type and size of installed anchors and fasteners selected by Architect.
 5. Test to 90 percent of rated proof load of device.
- C. Nonconforming Work:
 1. Seismic controls will be considered defective if they do not pass tests and inspections.
 2. Remove and replace malfunctioning units and retest as specified above.
- D. Prepare test and inspection reports.

END OF SECTION

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Labels.
 - 2. Bands and tubes.
 - 3. Tapes and stencils.
 - 4. Tags.
 - 5. Signs.
 - 6. Cable ties.
 - 7. Miscellaneous identification products.

1.02 ACTION SUBMITTALS

- A. Product Data:
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1.
- B. Comply with 29 CFR 1910.144 for color identification of hazards; 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs and tags; and the following:
 - 1. Fire-protection and fire-alarm equipment, including raceways, must be finished, painted, or suitably marked safety red.
 - 2. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft above finished floor.
- C. Signs, labels, and tags required for personnel safety must comply with the following standards:
 - 1. Safety Colors: NEMA Z535.1.
 - 2. Facility Safety Signs: NEMA Z535.2.
 - 3. Safety Symbols: NEMA Z535.3.
 - 4. Product Safety Signs and Labels: NEMA Z535.4.
 - 5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.
- D. Comply with NFPA 70E requirements for arc-flash warning labels.

- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, must comply with UL 969.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F (100 deg C), material surfaces.

2.02 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 1000 V or Less:
 - 1. Black letters on orange field.
 - 2. Legend: Indicate voltage and system or service type.
- B. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - 1. Color must be factory applied or field applied for sizes larger than 8 AWG if authorities having jurisdiction permit.
 - 2. Colors for 208Y/120 V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - 3. Colors for 480Y/277 V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.
 - 4. Color for Neutral: White for 208V and gray for 480V.
 - 5. Color for Equipment Grounds: Green.
- C. Warning Label Colors:
 - 1. Identify system voltage with black letters on orange background.
- D. Warning labels and signs must include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 3 FEET MINIMUM."
- E. Equipment Identification Labels:
 - 1. Black letters on white field.

2.03 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
- B. Self-Adhesive Wraparound Labels: Preprinted, 3 mil thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
 - 1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over legend. Labels sized such that clear shield overlaps entire printed legend.
 - 2. Marker for Labels:
 - a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - b. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- C. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3 mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
 - 1. Minimum Nominal Size:
 - a. 1-1/2 by 6 inch for raceway and conductors.
 - b. 3-1/2 by 5 inch for equipment.
 - c. As required by authorities having jurisdiction.

2.04 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mil thick by 1 to 2 inch wide; compounded for outdoor use.
- C. Tape and Stencil: 4 inch wide black stripes on 10 inch centers placed diagonally over orange background and are 12 inch wide. Stop stripes at legends.
- D. Floor Marking Tape: 2 inch wide, 5 mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.
- E. Underground-Line Warning Tape:
 - 1. Tape:
 - a. Recommended by manufacturer for method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - b. Printing on tape must be permanent and may not be damaged by burial operations.
 - c. Tape material and ink must be chemically inert and not be subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
 - 2. Color and Printing:
 - a. Comply with APWA Uniform Color Code using NEMA Z535.1 safety colors.
 - b. Inscriptions for Red Tapes: "CAUTION BURIED ELECTRIC LINE BELOW".

- c. Inscriptions for Orange Tapes: "CAUTION BURIED COMMUNICATION LINE BELOW".
- 3. Tape:
 - a. Detectable three-layer laminate, consisting of printed pigmented polyolefin film, solid aluminum-foil core, and clear protective film that allows inspection of continuity of conductive core; bright colored, compounded for direct-burial service.
 - b. Width: 3 inch.
 - c. Overall Thickness: 5 mil.
 - d. Foil Core Thickness: 0.35 mil.
 - e. Weight: 28 lb/1000 sq. ft.
 - f. Tensile in accordance with ASTM D882: 70 lbf and 4600 psi.
- F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height must be 1 inch.

2.05 TAGS

- A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
- B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.023 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

2.06 SIGNS

- A. Baked-Enamel Signs:
 - 1. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
 - 2. 1/4 inch grommets in corners for mounting.
 - 3. Nominal Size: 7 by 10 inch.
- B. Metal-Backed Butyrate Signs:
 - 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396 inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
 - 2. 1/4 inch grommets in corners for mounting.
 - 3. Nominal Size: 10 by 14 inch.
- C. Laminated Acrylic or Melamine Plastic Signs:
 - 1. Engraved legend.
 - 2. Thickness:
 - a. For signs up to 20 sq. inch, minimum 1/16 inch thick.
 - b. For signs larger than 20 sq. inch, 1/8 inch thick.
 - c. Engraved legend with white letters on dark gray background.
 - d. Punched or drilled for mechanical fasteners with 1/4 inch grommets in corners for mounting.
 - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.07 CABLE TIES

- A. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F in accordance with ASTM D638: 7000 psi.
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F.
 - 5. Color: Black.

2.08 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.02 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. System Identification for Raceways and Cables under 1000 V: Identification must completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.

- H. System Identification for Raceways and Cables over 1000 V: Identification must completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.
- K. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:
 - 1. "LIGHTING."
 - 2. "POWER."
 - 3. "HVAC."
 - 4. "COMMUNICATIONS"
- L. Vinyl Wraparound Labels:
 - 1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.
- M. Snap-Around Labels: Secure tight to surface at location with high visibility and accessibility.
- N. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.
- O. Self-Adhesive Labels:
 - 1. Install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high label; where two lines of text are required, use labels 2 inch high.
- P. Snap-Around Color-Coding Bands: Secure tight to surface at location with high visibility and accessibility.
- Q. Heat-Shrink, Preprinted Tubes: Secure tight to surface at location with high visibility and accessibility.
- R. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.
- S. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.
 - 1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for minimum distance of 6 inch where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- T. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

- U. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's instructions.
- V. Underground Line Warning Tape:
 - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inch below finished grade. Use multiple tapes where width of multiple lines installed in common trench exceeds 16 inch overall.
 - 2. Limit use of underground-line warning tape to direct-buried cables.
 - 3. Install underground-line warning tape for direct-buried cables and cables in raceways.
- W. Metal Tags:
 - 1. Place in location with high visibility and accessibility.
 - 2. Secure using plenum-rated cable ties.
- X. Nonmetallic Preprinted Tags:
 - 1. Place in location with high visibility and accessibility.
 - 2. Secure using plenum-rated cable ties.
- Y. Write-on Tags:
 - 1. Place in location with high visibility and accessibility.
 - 2. Secure using plenum-rated cable ties.
- Z. Baked-Enamel Signs:
 - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
 - 2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on minimum 1-1/2 inch high sign; where two lines of text are required, use signs minimum 2 inch high.
- AA. Metal-Backed Butyrate Signs:
 - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
 - 2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high sign; where two lines of text are required, use labels 2 inch high.
- BB. Laminated Acrylic or Melamine Plastic Signs:
 - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
 - 2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high sign; where two lines of text are required, use labels 2 inch high.
- CC. Cable Ties: General purpose, for attaching tags, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.

3.03 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Concealed Raceways, Duct Banks, More Than 1000 V, within Buildings: Tape and stencil. Stencil legend "DANGER - CONCEALED HIGH-VOLTAGE WIRING" with 3 inch high, black letters on 20 inch centers.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, and at 10 ft maximum intervals.
- D. Accessible Raceways and Metal-Clad Cables, 1000 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
- E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with conductor or cable designation, origin, and destination.
- F. Control-Circuit Conductor Termination Identification: For identification at terminations, provide [self-adhesive labels] with conductor designation.
- G. Conductors to Be Extended in Future: Attach marker tape to conductors and list source.
- H. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
- I. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- J. Concealed Raceways and Duct Banks, More Than 1000 V, within Buildings: Apply floor marking tape to the following finished surfaces:
 - 1. Floor surface directly above conduits running beneath and within 12 inch of floor that is in contact with earth or is framed above unexcavated space.
 - 2. Wall surfaces directly external to raceways concealed within wall.
 - 3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in building, or concealed above suspended ceilings.
- K. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in direction of access to live parts. Workspace must comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

- L. Instructional Signs: Self-adhesive labels, including color code for grounded and ungrounded conductors.
- M. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Metal-backed, butyrate warning signs.
 - 1. Apply to exterior of door, cover, or other access.
- N. Arc Flash Warning Labeling: Self-adhesive labels.
- O. Operating Instruction Signs: Laminated acrylic or melamine plastic signs.
- P. Equipment Identification Labels:
 - 1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
 - 2. Outdoor Equipment: Stenciled legend 4 inch high.
 - 3. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in location provided by panelboard manufacturer. Panelboard identification must be in form of engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Transformers: Label that includes tag designation indicated on Drawings for transformer, feeder, and panelboards or equipment supplied by secondary.
 - e. Enclosed switches.
 - f. Enclosed circuit breakers.
 - g. Enclosed controllers.
 - h. Variable-speed controllers.
 - i. Push-button stations.
 - j. Contactors.
 - k. Remote-controlled switches, dimmer modules, and control devices.
 - l. Battery-inverter units.
 - m. Monitoring and control equipment.

END OF SECTION

SECTION 262416

PANELBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.

1.03 DEFINITIONS

- A. ATS: Acceptance testing specification.
- B. GFCI: Ground-fault circuit interrupter.
- C. GFEP: Ground-fault equipment protection.
- D. HID: High-intensity discharge.
- E. MCCB: Molded-case circuit breaker.
- F. SPD: Surge protective device.
- G. VPR: Voltage protection rating.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
 - 1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
 - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details.
 - 2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.

3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Include evidence of NRTL listing for SPD as installed in panelboard.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include wiring diagrams for power, signal, and control wiring.
10. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.06 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.07 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Keys: Two spares for each type of panelboard cabinet lock.

1.08 QUALITY ASSURANCE

- A. Manufacturer Qualifications: ISO 9001 or ISO 9002 certified.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NECA 407.

1.10 FIELD CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards 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.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding minus 22 deg F to plus 104 deg F.
 - b. Altitude: Not exceeding 6600 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 - 1. Ambient temperatures within limits specified.
 - 2. Altitude not exceeding 6600 feet.

1.11 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
 - 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PANELBOARDS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. 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.
- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.
- F. Enclosures: Flush and Surface-mounted, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Wash-Down Areas: NEMA 250, Type 4X.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

- e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
- 2. Height: 84 inches maximum.
- 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
- 4. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
- G. Incoming Mains:
 - 1. Location: Top or Bottom.
 - 2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.
- H. Phase, Neutral, and Ground Buses:
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - a. Plating shall run entire length of bus.
 - b. Bus shall be fully rated the entire length.
 - 2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
 - 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 - 4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
- I. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Terminations shall allow use of 75 deg C rated conductors without derating.
 - 3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
 - 4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
 - 5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
 - 6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 - 7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- J. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

- K. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
 - 1. Percentage of Future Space Capacity: as shown on panel schedules.
- L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
 - 1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
 - 2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.02 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2.03 POWER PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Eaton.
 - 2. Square D; Schneider Electric USA.
- B. Panelboards: NEMA PB 1, distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 - 1. For doors more than 36 inches high, provide two latches, keyed alike.
- D. Mains: Circuit breaker or Main Lugs only as per Panel Schedules.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.
- G. Branch Overcurrent Protective Devices: Fused switches.

2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Eaton.

- 2. Square D; Schneider Electric USA.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker] or Main lugs only per panel schedules.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

2.05 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Eaton.
 - 2. Square D; Schneider Electric USA.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. Electronic Trip Circuit Breakers:
 - a. RMS sensing.
 - b. Field-replaceable rating plug or electronic trip.
 - c. Digital display of settings, trip targets, and indicated metering displays.
 - d. Multi-button keypad to access programmable functions and monitored data.
 - e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
 - f. Integral test jack for connection to portable test set or laptop computer.
 - g. Field-Adjustable Settings:
 - 1) Instantaneous trip.
 - 2) Long- and short-time pickup levels.
 - 3) Long and short time adjustments.
 - 4) Ground-fault pickup level, time delay, and I squared T response.
 - 4. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
 - 5. Subfeed Circuit Breakers: Vertically mounted.
 - 6. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.

- c. UL listed for reverse connection without restrictive line or load ratings.
- d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
- e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
- f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
- g. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
- h. Multipole units enclosed in a single housing with a single handle.
- i. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on position.

2.06 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.
 - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.
- D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
 - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.07 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NECA 407.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.
- C. Install panelboards and accessories according to NECA 407.
- D. Equipment Mounting:
 - 1. Install panelboards on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
 - 2. Attach panelboard to the vertical finished or structural surface behind the panelboard.
 - 3. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- F. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- G. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- H. Mount panelboard cabinet plumb and rigid without distortion of box.
- I. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- J. Mount surface-mounted panelboards to steel slotted supports 1-1/4 inch in depth. Orient steel slotted supports vertically.
- K. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
 - 2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- L. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- M. Install filler plates in unused spaces.

- N. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- O. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- P. Mount spare fuse cabinet in accessible location.

3.03 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- D. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Do not perform optional tests. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:

- a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
- E. Panelboards will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.05 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573.16 "Coordination Studies."
- C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.
 - 1. Measure loads during period of normal facility operations.
 - 2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
 - 3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
 - 4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.06 PROTECTION

- A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

**SECTION 262726
WIRING DEVICES**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. General-use switches, dimmer switches, and fan-speed controller switches.
 - 2. General-grade duplex straight-blade receptacles.
 - 3. Hospital-grade straight-blade receptacles.
 - 4. Receptacles with arc-fault and ground-fault protective devices.
 - 5. Locking receptacles.
 - 6. Special-purpose power outlet assemblies.
 - 7. Connectors, cords, and plugs.
- B. Related Requirements:

1.02 DEFINITIONS

1.03 ACTION SUBMITTALS

- A. Product Data:
 - 1. Toggle switches.
 - 2. Key lock switches.
 - 3. Duplex straight-blade receptacles.
 - 4. Duplex straight-blade receptacles with integral switching means.
 - 5. Hospital-grade straight-blade receptacles.
 - 6. Receptacles with GFCI device.
- B. Shop Drawings:
 - 1. Wiring diagrams for duplex straight-blade receptacles with integral switching means.
- C. Field Quality-Control Submittals:
 - 1. Field quality-control reports.

1.04 INFORMATIONAL SUBMITTALS

- A. Manufacturers' Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:
 - 1. Dimmers.
 - 2. Single straight-blade receptacles.
 - 3. Duplex straight-blade receptacles.
 - 4. Duplex straight-blade receptacles with integral switching means.
 - 5. Hospital-grade straight-blade receptacles.

6. Receptacles with GFCI device.

1.05 CLOSEOUT SUBMITTALS

1.06 WARRANTY FOR DEVICES

- A. Special Manufacturer Extended Warranty: Manufacturer warrants that devices perform in accordance with specified requirements and agrees to provide repair or replacement of devices that fail to perform as specified within extended warranty period.
 1. Extended Warranty Period: Three years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.01 GENERAL-USE SWITCHES, DIMMER SWITCHES, AND FAN-SPEED CONTROLLER SWITCHES

- A. Toggle Switch:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour; Legrand North America, LLC.
 2. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 3. General Characteristics:
 - a. Reference Standards: UL CCN WMUZ and UL 20.
 4. Options:
 - a. Device Color: White.
 - b. Configuration:
 - 1) General-duty, 120-277 V, 20 A,.
 - 2) Extra-heavy-duty, 120-277 V, 20 A,.
 5. Accessories:
 - a. Cover Plate: 0.035-inch thick, satin-finished, Type 302 stainless steel.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.02 GENERAL-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES

A. Duplex Straight-Blade Receptacle:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour; Legrand North America, LLC.
2. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
3. General Characteristics:
 - a. Reference Standards: UL CCN RTRT and UL 498.
4. Options:
 - a. Device Color: White.
 - b. Configuration:
 - 1) Heavy-duty, NEMA 5-20R.
5. Accessories:
 - a. Cover Plate: .0035-inch thick, satin-finished, Type 302 stainless steel.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

B. Wired Full-Controlled Duplex Straight-Blade Receptacle:

1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. General Characteristics:
 - a. Reference Standards: UL CCN RTX1 and UL Subject 498B.
3. Options:
 - a. Device Color: White
 - b. Configuration: NEMA 5-20R.
4. Accessories:
 - a. Cover Plate: 0.035-inch thick, satin-finished, Type 302 stainless steel.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

- C. Wired Half-Controlled Duplex Straight-Blade Receptacle:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. General Characteristics:
 - a. Reference Standards: UL CCN RTX1 and UL Subject 498B.
 - 3. Options:
 - a. Device Color: White
 - b. Configuration: NEMA 5-20R.
 - 4. Accessories:
 - a. Cover Plate: 0.035-inch thick, satin-finished, Type 302 stainless steel.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.03 HOSPITAL-GRADE STRAIGHT-BLADE RECEPTACLES

- A. Hospital-Grade, Non-Ferrous Duplex Straight-Blade Receptacle:
 - 1.
 - 2. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 3. General Characteristics:
 - a. Reference Standards: UL CCN RTRT and UL 498.
 - 4. Options:
 - a. Device Color: White.
 - b. Configuration: Extra-heavy-duty, [**NEMA 5-20R**].
 - 5. Accessories:
 - a. Cover Plate: 0.035-inch thick, satin-finished, Type 302 stainless steel.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.04 RECEPTACLES WITH GROUND-FAULT PROTECTIVE DEVICES

2.05 LOCKING RECEPTACLES

A. NEMA, 125 V, Locking Receptacle:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour; Legrand North America, LLC.
2. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
3. General Characteristics:
 - a. Reference Standards: UL CCN RTRT and UL 498.
4. Options:
 - a. Device Color: Black with yellow voltage indication on face.
 - b. Configuration: 2 pole, 3 wire, grounding, NEMA L5-20R and NEMA L5-30R.

B. NEMA, 250 V, Locking Receptacle:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour; Legrand North America, LLC.
2. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
3. General Characteristics:
 - a. Reference Standards: UL CCN RTRT and UL 498.
4. Options:
 - a. Device Color: Black with blue voltage indication on face.

b. Configuration:

- 1) 2 pole, 3 wire, grounding, NEMA L6-20R and NEMA L6-30R.

2.06 SPECIAL-PURPOSE POWER OUTLET ASSEMBLIES

A. Ceiling-Mounted or Wall-Mounted Power Outlet Cord Management Assembly:

1. Source Limitations: Obtain all components for each power outlet cord management assembly from single manufacturer.
2. Regulatory Requirements: Components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.07 CONNECTORS, CORDS, AND PLUGS

PART 3 - EXECUTION

3.01 EXAMINATION

A. Receptacles:

1. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

3.02 INSTALLATION OF SWITCHES

A. Comply with manufacturer's instructions.

B. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
3. Consult Architect for resolution of conflicting requirements.

C. Identification:

1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."
 - a. Mark cover or cover plate using engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.

3.03 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES

A. Comply with manufacturer's instructions.

B. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
3. Receptacle Orientation: Unless otherwise indicated in Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.
4. Consult Architect for resolution of conflicting requirements.

C. Identification:

1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."
 - a. Mark cover or cover plate using hot, stamped, or engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.

3.04 INSTALLATION OF LOCKING RECEPTACLES

A. Comply with manufacturer's instructions.

B. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
3. Receptacle Orientation: Unless otherwise indicated in Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.
4. Consult Architect for resolution of conflicting requirements.

C. Identification:

1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."
 - a. Mark cover or cover plate using hot, stamped, or engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.

3.05 FIELD QUALITY CONTROL OF SWITCHES

A. Field tests and inspections must be witnessed by Architect.

B. Tests and Inspections:

1. Perform tests and inspections in accordance with manufacturers' instructions.
2. .

C. Nonconforming Work:

1. Unit will be considered defective if it does not pass tests and inspections.
 2. Remove and replace defective units and retest.
- D. Assemble and submit test and inspection reports.
- E. Manufacturer Services:
1. Engage factory-authorized service representative to support field tests and inspections.

3.06 FIELD QUALITY CONTROL OF STRAIGHT-BLADE RECEPTACLES

- A. Field tests and inspections must be witnessed by Architect.
- B. Tests and Inspections:
1. Insert and remove test plug to verify that device is securely mounted.
 2. Verify polarity of hot and neutral pins.
 3. Measure line voltage.
 4. Measure percent voltage drop.
 5. Measure grounding circuit continuity; impedance must be not greater than 2 ohms.
- C. Nonconforming Work:
1. Device will be considered defective if it does not pass tests and inspections.
 2. Remove and replace defective units and retest.
- D. Assemble and submit test and inspection reports.

3.07 ADJUSTING

- A. Occupancy Adjustments for Controlled Receptacles: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions.

3.08 PROTECTION

- A. Devices:
1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.
 2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Non-fusible switches.
 - 3. Molded-case circuit breakers (MCCBs).
 - 4. Enclosures.

1.03 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.
- B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Data: Certificates, for enclosed switches and circuit breakers, accessories, and components, from manufacturer.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.

1.06 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.
 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - b. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

1.07 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by NETA.
 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.08 FIELD CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
 2. Altitude: Not exceeding 6600 feet.

1.09 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2.02 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

2.03 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Eaton.
 - 2. Square D; Schneider Electric USA.
- B. Type HD, Heavy Duty:
 - 1. Single throw.
 - 2. Three pole.
 - 3. 240 and 600-V ac.
 - 4. 1200 A and smaller.
 - 5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses.
 - 6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.

2.04 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton.
2. Square D; Schneider Electric USA.

B. Type HD, Heavy Duty, Three Pole, Single Throw, 240 and 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.

2.05 MOLDED-CASE CIRCUIT BREAKERS

A. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

B. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

C. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated. combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations.

- D. MCCBs shall be equipped with a device for locking in the isolated position.
- E. Lugs shall be suitable for 194 deg F rated wire, sized according to the 167 deg F temperature rating in NFPA 70.
- F. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- G. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 - 1. Instantaneous trip.
 - 2. Long- and short-time pickup levels.
 - 3. Long- and short-time time adjustments.
 - 4. Ground-fault pickup level, time delay, and I-squared t response.
- H. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- I. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 - 3. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.

2.06 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: The enclosure shall be gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1) and gray baked enamel paint, electrodeposited on cleaned, phosphatized galvanized steel (NEMA 250 Types 3R, 12).
- C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
- D. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.
- E. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.02 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Wash-Down Areas: NEMA 250, Type 4X.
 - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 - 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

3.03 INSTALLATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E. Install fuses in fusible devices.
- F. Comply with NFPA 70 and NECA 1.

3.04 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.05 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

- a. Inspect physical and mechanical condition.
- b. Inspect anchorage, alignment, grounding, and clearances.
- c. Verify that the unit is clean.
- d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
- e. Verify that fuse sizes and types match the Specifications and Drawings.
- f. Verify that each fuse has adequate mechanical support and contact integrity.
- g. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
- h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
- i. Verify correct phase barrier installation.
- j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
- b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
- c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
- d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.

- e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."
- C. Enclosed switches will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.
 - 1. Test procedures used.
 - 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
 - 3. List deficiencies detected, remedial action taken, and observations after remedial action.

3.06 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573.16 "Coordination Studies."

END OF SECTION

SECTION 26 51 19

LED INTERIOR LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. LED Fixtures
 - 2. Materials.
 - 3. Luminaire support.
- B. Related Requirements:
 - 1. Section 26 09 43.23 "Relay-Based Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.

1.03 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.
 - 3. Include physical description and dimensions of luminaires.
 - 4. Include emergency lighting units, including batteries and chargers.
 - 5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
 - 6. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The

adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.

- a. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
- B. Shop Drawings: For nonstandard or custom luminaires.
 1. Include plans, elevations, sections, and mounting and attachment details.
 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 3. Include diagrams for power, signal, and control wiring.
- C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.05 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Luminaires.
 2. Suspended ceiling components.
 3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
 4. Structural members to which equipment and or luminaires will be attached.
 5. Initial access modules for acoustical tile, including size and locations.
 6. Items penetrating finished ceiling, including the following:
 - a. Other luminaires.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Ceiling-mounted projectors.
 - g. .
 7. Moldings.
 8. .
- B. Qualification Data: For testing laboratory providing photometric data for luminaires.
- C. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Product Test Reports: For each type of luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.
- E. Sample warranty.

1.06 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
 - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.07 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications:
 - 1. Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- B. Provide luminaires from a single manufacturer for each luminaire type.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.09 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Seismic Performance:
 - 1. Luminaires shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
 - 2. Luminaires and lamps shall be labeled vibration and shock resistant.
 - 3. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."
- B. Ambient Temperature: 5 to 104 deg F.
 - 1. Relative Humidity: Zero to 95 percent.
- C. Altitude: Sea level to 6000 feet

2.02 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI.
- C. Recessed luminaires shall comply with NEMA LE 4.
- D. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- E. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

2.03 LIGHT FIXTURES

- A. Refer to Light Fixture Schedule in Electrical drawings for specifications and requirements.

2.04 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging.
- B. Steel:
 - 1. ASTM A36/A36M for carbon structural steel.
 - 2. ASTM A568/A568M for sheet steel.
- C. Stainless Steel:
 - 1. Manufacturer's standard grade.
 - 2. Manufacturer's standard type, ASTM A240/240M.
- D. Galvanized Steel: ASTM A653/A653M.
- E. Aluminum: ASTM B209.

2.05 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.06 LUMINAIRE SUPPORT

- A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 TEMPORARY LIGHTING

- A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.03 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- E. Flush-Mounted Luminaires:
 - 1. Secured to outlet box.
 - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 - 3. Trim ring flush with finished surface.
- F. Wall-Mounted Luminaires:
 - 1. Attached to structural members in walls.

2. Do not attach luminaires directly to gypsum board.
- G. Suspended Luminaires:
 1. Ceiling Mount:
 - a. Four-point pendant mount with 5/32-inch- diameter aircraft cable supports adjustable to 10 feet in length.
 - b. Hook mount.
 2. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 3. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
 4. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
 5. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- H. Ceiling-Grid-Mounted Luminaires:
 1. Secure to any required outlet box.
 2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
- I. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.04 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.05 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

3.06 STARTUP SERVICE

- A. Comply with requirements for startup specified in Section 26 09 43.23 "Relay-Based Lighting Controls."

3.07 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied

conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION

SECTION 32 93 00

PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Division 01 - General Requirements, and other applicable specification sections in the Project Manual apply to the work specified in this Section.

1.2 SUMMARY

- A. Description
 - 1. Work includes: Provide all labor, materials and installation necessary to complete the fine grading, incidental grading, planting and related work as required; procure applicable licenses, permits and fees.
- B. This Section includes the following:
 - 1. Plant materials

1.3 REFERENCED STANDARDS

- A. ANSI Z260.1 – American Standards for Nursery Stock (ASNS).

1.4 LAWS, CODES AND REGULATIONS

- A. Perform Work in accordance with all applicable laws, codes and regulations required by authorities having jurisdiction over such Work and provide for all inspections and permits required by federal, state and local authorities in furnishing, transporting and installing materials as shown or for completing the Work identified herein.

1.5 EXISTING UTILITIES

- A. Existing utilities and improvements not designated for removal shall be protected in place. Any damage shall be repaired by the Contractor at no additional cost to the Owner.

1.6 SUBMITTALS

A. Certificates:

1. The Contractor shall submit to the Owner's Representative and Architect, as soon as possible and before importing materials to the site, two (2) copies of certificates of inspection or the manufacturer's and/or vendor's certified analysis as required by governmental authorities for soil amendments, fertilizer materials, and chemicals. The Contractor shall submit other data substantiating that all other landscape materials comply with specified requirements. Certification shall indicate the supplier's name, address, telephone number, date of purchase, name, technical description of item, and quantity of each item purchased.
2. The Contractor shall supply two (2) copies of the manufacturer's certified analysis for all packaged standard materials to the Owner's Representative and Architect for approval, no more than 30 days after the award of the contract.
3. The Contractor shall also submit product samples to the Owner's Representative and Architect for final acceptance.
4. The Contractor shall supply four (4) copies of certificates of inspection by state, federal and other governmental authorities indicating the origin and health for all plant material to the Owner's Representative and Architect for approval. Inspection certificates shall include:

B. Test Reports:

1. The Contractor shall submit landscape material test reports for the following:
 - a. Purchased topsoil and supplier information, including product composition, nutrient analysis, pH, and organic matter, for approval.
 - b. Fertilizers/soil amendments/chemicals

C. Product Data and Samples:

1. Along with the soil test reports and soil amendment recommendations The Contractor shall submit to the Owner's Representative and Architect, as soon as possible and prior to importing materials to the site, two (2) copies of the manufacturer's comprehensive product description, including specifications, installation instructions and certified laboratory analysis of the following items:
 - a. Soil amendments and conditioners
 - b. Fertilizers, herbicides and pesticides
 - c. Topsoil from site
2. Rejected materials and plants shall be immediately removed from the site at the Contractor's expense. Cost of testing materials and plants not meeting specifications shall be paid by the Contractor.

D. License Requirements:

1. Pesticide: The Contractor shall be a licensed pesticide applicator or shall employ a licensed pesticide applicator for the treatment of insects, diseases, animals as required by the Pesticide Laws and Regulations of the Texas Department of Agriculture. The Architect or designated representative may require documentation of such certification as necessary for his record.
2. Herbicide: The Contractor shall possess a permit or employ a person who possesses a permit to apply herbicide as required by the Herbicide Laws of the Texas Department of Agriculture. The Architect or designated representative may require documentation of such certification as necessary for his records.

E. Additional Samples and Lists:

1. Plant Material Delivery Schedule.
2. Documentation of plant availability.
3. Documentation of plant procurement including where plants are grown.
4. Tagged material records.
5. Request for a pre-planting review of plant materials and quantities.
6. Records of tagged material.

1.7 QUALITY ASSURANCE

- A. Plant material shall be reviewed by the Owner's Representative and/or Architect. Owner's Representative and Architect shall reserve the right to refuse any plant material that is unacceptable upon delivery to the site.
- B. Quality and size shall conform with the current edition of "Horticultural Standards" for #1 Grade Nursery Stock as adopted by the American Association of Nurserymen and/or Texas Nursery & Landscape Association (TNLA) Recommended Average Tree Specifications.
- C. Plant materials shall be placed in their proper location or staked for review by the Owner's Representative and/or Architect before planting
- D. Mockups: Mockups shall demonstrate material colors, techniques and standards of workmanship.
 1. 2'x2' inert ground cover per details.
 2. Build mockups in the location and of the size indicated.
 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 4. Obtain the Architect's approval of mockups before starting construction.
 5. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed work.
 6. Approved mockups may become part of the completed Work if undisturbed at the time of Substantial Completion
- E. Contractor shall schedule a Pre-Construction Conference with General Contractor, Owner's Representative and Architect at least seven (7) days before beginning Work under this section. Purpose of this conference is to review questions the Contractor may have regarding administrative procedures during construction project work schedule, and coordination with other trades or work activities.

1.8 REVIEWS

- A. All plant locations shall be staked or flagged for the Owner's Representative approval before planting.
- B. Fine grading shall be reviewed and approved by the Architect before planting.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Protect all materials used for construction from damage, deterioration, or loss of any kind while in storage and during construction.
- B. Erect barriers and warning signs as necessary to prevent injury to the public and construction personnel.
- C. Deliver soil amendments in the manufacturer's standard packaging.
- D. Deliver fertilizer uniform in composition, free-flowing, and suitable for application with approved equipment, delivered to the site in bags or other containers, each fully labeled and bearing the name and warranty of the producer.
- E. Each tree, shrub, groundcover flat, container of fertilizer, or other construction material shall be labeled by the grower or manufacturer as a separate item. Bulk deliveries of mulch, granite, topsoil, etc. shall be accompanied by two delivery tickets. One delivery ticket shall be provided to the Owner's Representative and one shall be provided to the Architect.
- F. Provide protective covers to plant life during delivery; shrubs shall not be pruned before delivery and/or bent or bind-tied in such a manner as to cause damage or destroy natural shape.
- G. Deliver materials after preparations for planting have been completed and plant immediately. If planting is delayed for more than six (6) hours after delivery, the Contractor shall set plant material in shade, protect from weather and mechanical damage, and keep roots moist. The contractor is liable for the replacement of damaged material with like material from the same supplier. Do not remove container-grown stock, including ground cover, from containers until planting time.
- H. Provide bulk materials processed and blended off-site when specified. These materials shall be delivered in clean, washed and covered trucks to eliminate contamination during transportation. On-site stockpiling locations shall be coordinated with the Owner and Construction Manager; stockpile shall occur in areas free of debris and away from drainage routes. All bulk material shall be covered with plastic or geotextile if the material is to be stockpiled for more than twenty-four (24) hours.
- I. Prior to delivery of any plants to the project site, the Contractor shall make the necessary arrangements with the Owner for an inspection of the plant material. Travel to non-local nurseries, out of the metropolitan project area, when requested by Contractor, will be paid for by Contractor. Plants found to be unsuitable in growth or condition, or plants not true to specification shall be removed and replaced with acceptable plants.
- J. Notify Owner at least forty-eight (48) hours in advance for inspection of the plant material at the offsite location. Prior to notification of the Owner, the Contractor shall physically verify that the plant material meet the size specified.

1.10 JOB CONDITIONS

- A. Locate and identify existing underground and overhead services and utilities within contract-limit work areas. Provide adequate means of protection of utilities and services designated to remain. All utilities damaged during site work operations shall be repaired at the Contractor's expense.

- B. When uncharted or incorrectly charted underground piping or other utilities and services are encountered during site work operations, notify the applicable utility company immediately to obtain procedure directions. Cooperate with the applicable utility company in maintaining active services in operation.
- C. Cooperate and coordinate with other Contractors and trades working in and adjacent to landscape areas. Confirm the sequencing of installing landscape and irrigation equipment as to not conflict with or damage future and/or installed work by others.
- D. Planting areas shall be left free of construction debris and/or toxic material and subgraded to a level to permit landscape and irrigation construction. Trenches, foundation backfill or other filled excavations shall be compacted prior to the site being turned over to the Landscape Contractor. No soil preparation or planting shall begin before the site has been cleared and cleaned of debris. Commencement of work indicates acceptance of job site conditions by the Landscape Contractor.
- E. Planting areas shall remain weed free.
- F. Stockpiled topsoil locations shall be as designated by the Owner's Representative. Use care in protecting stockpiled soil.
- G. Protect and maintain control boxes, curb boxes, valves and other services, except items designated for removal.
- H. Protect and maintain grade control stakes set by others until directed otherwise.
- I. Protect existing utilities, paving and other facilities from damage during landscaping operations.
- J. Site shall have grades at +/- 1/10 of one (1) foot except as noted. The planting areas shall be free of waste or debris developed by other trades. Discrepancy from these conditions shall be reported to the Owner's Representative and Architect before beginning construction.

1.11 SUBSTITUTIONS

- A. Plants of kinds other than those indicated on the Construction Documents will be considered by the Architect upon submission of evidence that the listed plant is not reasonably procurable in the local region. The replacement plant will be approved on the grounds that it resembles the plant specified in regards to appearance, ultimate height, shape, habit of growth and general soil and other requirements. In no case shall the average cost and value of the substituted plants be less than the cost and value of plants indicated.

1.12 WARRANTY AND REPLACEMENT

- A. The project warranty period shall begin upon written final acceptance of the project installation of plants by the Owner's Representative.
- B. Shrubs and Other Plantings Warranty:
 - 1. The Contractor shall warrant that all other plantings to be alive and in satisfactory condition for a period of one (1) year after final acceptance except for defects resulting from neglect by the Owner, abuse, or damage by others.
 - 2. The Contractor shall be responsible for monitoring the Owner's care and provide written notification of any maintenance issues before problems occur.
 - 3. The Contractor shall maintain all plant material in a healthy, sturdy condition during the warranty period.
 - 4. The Contractor shall remove and replace dead or unhealthy shrubs, ground covers, and vines (or those that lose original form and size during the warranty period) with material equal to

that specified at no additional cost to the Owner. The Contractor shall replace any material that does not meet requirements within ten (10) days.

5. All replacement plants, including shrubs, groundcovers, vines and perennials shall be subject to an additional one (1)-year warranty period.

1.13 PLANT QUANTITIES

- A. If differences occur between quantities of plants shown on the Construction documents, the plants shown on the Construction Documents will be considered the correct number of plants to be supplied.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All plants and raw materials shall be manufactured and/or extracted or harvested within 500 miles of Project site.

2.2 PLANT MATERIAL

- A. Plants shall be high quality, exhibit a growth habit that is normal for the species, and be sound, vigorous, healthy, and free from insects, plant diseases and injury. Container, box, ball, height and spread dimensions shall be measured according to specified standards and good practice.
- B. Container plants shall have been in containers for sufficient length of time for root system to hold earth when taken from container but not long enough to become root-bound or cause "hardening-off." Heeled-in stock or stock from cold storage is not acceptable. Plants cut back from larger sizes to meet specifications will not be acceptable.
- C. Plant names shall conform to those given in "Standardized Plant Names" latest edition, prepared by the American Committee on Horticultural Nomenclature, or be names generally accepted by the trade.
- D. Select, dig, transport, protect and plant in accordance with requirements of these specifications and "American Standards for Nursery Stock" and with accepted good practice.
- E. Certificates shall accompany shipments as proof of inspection and quality as may be required by federal, state or other authorities. Each shipment shall be declared free of disease and insects of any kind. Label each plant or bundle and deliver bulk material in sealed, labeled bags, testifying as to percent of purity of contents.
- F. Should any conflict arise as to the quality of any plant materials, the decision of Owner's Representative and/or Architect is final.
- G. Provide letter stating verification of plant materials and sizes specified within twenty (20) days of General Contractor's notice to proceed. Be responsible for securing plant materials to have them available for installation at the appropriate time.

H. Plant Size:

1. When a range of size is shown on the Drawings, no plant shall be less than the minimum size and at least 40% of the plants shall be as large as the maximum size shown on the Drawings. The required measurements are the minimum sizes acceptable and are the measurements after pruning, when pruning is required.
 2. Sizes of plants or plant types will be measured in accordance with the plant standards or as indicated on the Drawings.
 3. Soil shall be approximately 3/4 depth of container and contain roots of the plant throughout the soil.
- I. Pruning shall not be done prior to delivery except with specified written approval from Owner's Representative and Architect. No pruning wounds shall be present with a diameter of more than 1" and such wounds must show vigorous bark growth on all edges. After installation, structure inappropriate for the normal plant shape or good growth shall be removed. Dead or damaged branches or cross-over growth shall be removed.
- J. Inspection of plant materials as required by city, county, state or federal authorities shall be the responsibility of the Contractor, who shall have secured permits or certificates prior to delivery of plants to site.
- K. Plants are subject to inspection and approval or rejection at the nursery source or on the project site at any time before or during the progress of Work for size, variety, condition, latent defects, and injuries. Remove rejected plants from the project site immediately.

2.3 TOPSOIL

- A. Imported topsoil should be sourced from reputable dealers and should be free of objectionable material, such as weed seeds, roots, rhizomes, or stolons. Unsuitable topsoil, or topsoil placed by the Contractor without approval on project areas, shall be required to be replaced at no additional cost to the client.
- B. Imported topsoil is well-blended, viable planting soil that meets the following specifications:
1. A loamy sand or sandy loam texture according to USDA textures. Clay content between 8 – 15 percent. Soil pH between 6.8 – 7.8
 2. Organic matter content of 2 – 4 %, dry weight basis
 3. Soluble salt concentrations shall not exceed 1.5 dS/m
 4. Sodium adsorption ratio (SAR) shall be <5
 5. Sufficient structure to give good tilth and aeration
 6. An infiltration rate of 3 inches per hour
 7. Soil shall not be compacted beyond the maximum allowable bulk density of 1.55 g/cm³ or 80 percent maximum dry density.
 8. Topsoil shall not include subsoils and shall contain no slag, cinders, stones, lumps of soil, sticks, roots, trash or other extraneous materials larger than one inch in diameter. Topsoil must also be free of nuisance weeds such as common bermudagrass, quackgrass, johnsongrass, nutsedge, poison ivy, Canada thistle, or others common to the area. All topsoil shall be tested by a reputable laboratory for pH, soluble salts, and micro and macro nutrients.
- C. Compost shall be used to increase organic matter content where needed. Compost shall be a well-decomposed, stable, weed free organic matter derived from agricultural, food, or yard trimmings. The product shall contain no substances toxic to plants and shall be reasonably free (<1% by dry

weight) of man-made foreign matter. The compost will possess no objectionable odors and shall not resemble the raw materials, which it was derived. All compost shall be tested by a reputable laboratory and must meet the following parameters:

1. pH range of 6.0 – 8.5
 2. Maximum soluble salt concentration of 10 dS/m
 3. Moisture content of 20 – 60 percent wet weight basis
 4. Organic matter content of 30 – 60 percent dry weight basis
- D. To minimize damage to soils, the contractor shall avoid driving or parking construction equipment on any soils that have been prepared for planting.
- E. Imported topsoils or manufactured soil blends designed to serve as topsoil may not be mined from the following:
1. Greenfield sites, unless soils are the waste by-product of a construction process
 2. Soils defined by the Natural Resource Conservation Service as prime farmland, unique farmland, farmland of statewide importance or local importance.
- F. Prior to spreading topsoils, existing subsoils shall be tilled to a depth of 6 inches to encourage root penetration and water infiltration in areas where vegetation will be grown. Tillage shall occur directly before spreading of the topsoil as to avoid re-compaction of the soil layers.

2.4 WATER

- A. Use clean, fresh water free from impurities injurious to vegetation. Provide hoses, connections, and other equipment necessary to distribute water from source to required locations. Do not waste water or let it run into city thoroughfares.

2.5 HERBICIDES

- A. Select least toxic herbicides to control weeds. Prioritize the use of natural herbicides over synthetic herbicides. Least toxic herbicides biodegrade quickly and minimize the threat to human health, water quality, ground water or aquatic species. Persistent weeds shall be removed by hand.

2.6 ADDITIONAL SOIL AMENDMENTS – AS RECOMMENDED BY OWNER AND LANDSCAPE ARCHITECT BASED ON SOIL TEST ANALYSIS:

- A. Sulphate of potash shall be agricultural grade containing 50% to 53% of water soluble potash.
- B. Organic fertilizer: 8-2-4 formula as manufactured by:
1. The Natural Gardener (512-288-9740)
 2. Peaceful Valley Farm Supply (www.groworganic.com)
 3. Approved equal.
- C. Root stimulator shall be Vitamin B-1 and shall not contain synthetic fertilizer.

PART 3 - EXECUTION

3.1 COORDINATION

- A. Coordinate as required with other trades to assure their proper and adequate interface with Work of this section. Coordinate schedules for installation of Work with schedules for other installations to assure orderly progress of the total construction sequence.
- B. No material or method shall affect the landscape planting and establishment. Materials and methods must conform to federal, state and local regulations.

3.2 EXAMINATION

- A. Examine areas to receive landscape installation for compliance with requirements and conditions affecting installation and performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Protect structures, utilities sidewalks, pavements, and other facilities, and existing vegetation from damage caused by landscape installation operations.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Prepare and amend soil for landscape areas and plant pits as recommended by agronomy test.
- D. Layout container plant location areas. Stake locations and outline areas for all plant materials for review by the Architect prior to installation and adjust as required. Obtain the Architect's acceptance of layout prior to planting.

3.4 INSTALLATION

- A. Plants shall be planted only when weather and soil conditions permit, and per locally accepted practices, and as reviewed by the Owner's Representative.
- B. Site Preparation: Prepare site by applying contact herbicide as per label directions to weed growth on site. Provide three (3) applications, each one week apart. Scarify planting areas to a minimum depth of six (6) inches. Float beds to grade and rake to remove weeds, clods, or rocks one (1) inch in diameter or greater. Thoroughly water-settle all soil.
- C. Topsoil Installation:
 - 1. Do not work soil when moisture content is so great that compaction will occur or when it is so dry that clods will not break readily. Apply water if necessary to bring soil to an optimum moisture content for filling and planting.
 - 2. All compacted soils will be treated as necessary to provide adequate aeration.

D. Fine grading

1. Fine grade all planting areas. Provide incidental grading of all areas adjacent to curbs and sidewalks. Grade planting areas to a smooth, uniform surface plane with loose, uniform fine texture. Remove ridges and fill depressions to meet finish grades. Soil grades adjacent to paving, curbs or headers shall be adjusted for surface materials. Therefore, or unless otherwise specified, soil grade at decomposed granite areas shall be 2 ½" inches below adjacent pavement.
2. Maintain or provide positive drainage away from all building structures. Drainage flows shall not be impaired with obstructions.
3. Unless otherwise specified, final grade (at top of any surface materials) shall be set at 1/2" inch below adjacent paving, curb and headers for planting beds unless shown otherwise.

E. Staking of Planting Locations:

1. All locations of shrubs and beds shall be staked in the field by the Contractor. All locations will be approved by the Architect or designated Owner's representative prior to any excavation of plant beds or bed preparation. Stakes shall be placed and coded to denote the type of plant material.

F. Excavation of Plant Pits: The Contractor shall not excavate plant pits more than 24 hours in advance of planting operations. Any plant pits left unattended for any length of time which may present a hazard shall be covered and/or clearly flagged as approved by the Engineer or designated representative. The walls and bottoms of all plant pits shall be scarified immediately prior to the placement of plants.

1. Pit Sizes: Planting holes may be dug by hand and shall be circular or square (according to the shape of the root ball) with vertical sides, unless otherwise indicated on the Drawings. Trimming of the sides or bottom of the hole to a uniform shape will not be required. Planting pit sizes shall be as follows unless indicated otherwise on the Drawings:
 - a. A minimum horizontal dimension of two (2) times the diameter of the root ball for the following plant specifications:
 - 1) Containers less than fifteen (15) gallons.
 - 2) Root ball diameter of Balled and burlapped or bag-grown plants fourteen (14) inches or less.
 - b. A minimum diameter for bare-root plants to permit the roots to spread without crowding or curving around the walls of the pit.
 - c. Planting pits shall be excavated to a depth of at least 4 inches but not more than 8 inches greater than the depth of the root ball of balled and burlapped, containerized, container grown or bag grown plants; or the depth of the root system of bare-root plants. Pits dug to excess depths shall be backfilled and compacted to bring the pits to the specified depth. The depth of pits on slopes shall be measured at the lower side.

G. Fill pits with water: Contact Owner's Representative and Landscape Architect if water does not percolate within 24 hours. Do not plant until proper measures have been taken to ensure appropriate percolation.

H. Pruning Roots

1. Root pruning shall be limited to the amount necessary to prune away broken and badly damaged roots.

I. Planting and Backfilling

1. Topsoil from the planting hole may be used for backfilling provided it is kept separate from subsoil and rendered loose and friable. Additional topsoil required to backfill the holes shall be furnished.
2. Depth of Transplanting
 - a. In general, plants shall be installed and covered with top soil approximately one (1) inch (25 mm) above the top of the root ball or container soil surface.
3. Bare Root Plants
 - a. After the backfill in the bottom of the planting pit has been firmed and the plant placed in the proper position, as shown on the Drawings, loose friable backfill or planting soil mixture shall be worked about the roots and thoroughly settled with water as the backfill is made. Care shall be taken to avoid bruising or breaking the roots. Sticks, sod, clods or other material which may form large air pockets in the soil or backfill shall not be included in the backfill.
4. Containerized or Container Grown Plants
 - a. At the time of planting the root ball and plant shall be carefully removed from the container to prevent damage to the plant and root ball. If in the opinion of the Landscape Architect or designated representative a sufficient amount of soil has fallen off or the ball has been broken to such an extent as to reduce the chances of the plant to grow, the plant will be rejected. Container plants shall be acclimated to outside growing conditions. Container plants shall be placed and backfilled in the same manner as balled and burlapped plants.

J. Vegetative Watering

1. During the planting operations, the Contractor shall keep the ground and backfill material moist to at least 12 inches around the root ball. When an irrigation system is shown on the Drawings, the Contractor shall coordinate his work to ensure that the irrigation system is operational as the plants are installed.

K. Pruning

1. Plants shall not be pruned immediately before delivery to the work site. Common nursery pruning practices are acceptable. Any necessary pruning shall be done at the time of planting as approved by the Architect or designated Owner's representative and shall be appropriate to the various types of plants and the special requirements of each.

3.5 CLEAN-UP

- A. Remove all waste and debris; clean all pavement of soil and mulch created by this work from the site.

3.6 DISPOSAL

- A. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, debris, and legally reuse or recycle them off the Owner's property at the Contractor's expense.

END OF SECTION