PROJECT MANUAL

Volume 1

Specifications Sections 0 through 14

MARIAN UNIVERSITY
ALUMNI HALL

MARIAN CAMPUS – Indianapolis, Indiana

Bid Package 2 Construction Documents

October 4, 2013

Owner:
Marian University

Architect:
RATIO Architects, Inc.

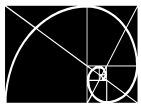
Structural Engineer
Fink Roberts and Petrie, Inc.

Mechanical/Electrical Engineer
R. E. Dimond and Associates

Civil Engineer:
Snelling Engineering

Construction Manager:
Wilhelm Construction

RATIO



ARCHITECTS

Ratio Project No. 12103.000

PROJECT MANUAL
VOLUME ONE – DIVISIONS 0 THROUGH 14

MARIAN UNIVERSITY ALUMNI HALL
Bid Package 2 - Construction Documents
Indianapolis, Indiana

OWNER:

Marian University
3200 Cold Spring Road
Indianapolis, Indiana 46222

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107 South Pennsylvania Street
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Michael J. East, P. E.

RATIO Project No. 12103.000
Date: October 4, 2013

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Greg Snelling, P. E.

RATIO Project No. 12103.000
Date: October 4, 2013

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

ISSUED SEPARATELY BY WILHELM

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Section 012600	Contract Modification Procedures
Section 012900	Payment Procedures
Section 013100	Project Management and Coordination
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NOT USED

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Section 054000	Cold-Formed Metal Framing
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Section 071616	Crystalline Waterproofing
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Section 072713	Modified Bituminous Sheet Air Barriers
Section 074213.16	Metal Plate Wall Panels
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Section 096513	Resilient Base and Accessories
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Section 096813	Tile Carpeting
Section 096900	Access Flooring
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Section 101419	Dimensional Letter Signage
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Section 102113	Toilet Compartments
Section 102226	Sliding Partition
Section 102238	Operable Glass-Panel Partitions
Section 102600	Wall and Door Protection
Section 102800	Toilet, Bath, and Laundry Accessories
Section 103100	Manufactured Fireplaces
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DIVISION 11 - EQUIPMENT

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Section 122413	Roller Window Shades
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NOT USED

DIVISION 14 - CONVEYING EQUIPMENT

NOT USED

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DIVISION 21 – FIRE SUPPRESSION (not included in DD Pricing Set)

Section 211000	Water Based Fire Suppression Systems

DIVISION 22 – PLUMBING (not included in DD Pricing Set)

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Section 233113	Metal Ducts
Section 233300	Air Duct Accessories
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DIVISION 26 – ELECTRICAL

Section 260519	Low-Voltage Electrical Power Conductors and Cables
Section 260523	Control-Voltage Electrical Power Cables
Section 260526	Grounding and Bonding for Electrical Systems
Section 260529	Hangers and Supports for Electrical Systems
Section 260533	Raceway and Boxes for Electrical Systems
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Section 260923	Lighting Control Devices
Section 260943.23	Relay-Based Lighting Controls
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Section 262816	Enclosed Switches and Circuit Breakers
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DIVISION 27 – COMMUNICATIONS

Section 270000	Communications
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Section 270528	Pathways for Communications
Section 270544	Sleeves and Sleeve Seals for Communications Pathways and Cabling
Section 270553	Identification for Communications Systems
Section 271100	Communications Equipment Room Fittings
Section 271101	Equipment Room Fittings
Section 271116	Cabinets, Racks, Frames, and Enclosures
Section 271119	Termination Blocks and Patch Panels
Section 271300	Communications Backbone Cabling
Section 271500	Communications Horizontal Cabling
Section 271500.23	Audio Video Horizontal Cabling
Section 271513	Copper Horizontal Cabling
Section 271543	Faceplates and Connectors
Section 275231	Security Emergency Call, Duress Alarm and Telecommunications

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

Section 280513	Conductors and Cables for Electronic Safety and Security
Section 280544	Sleeves and Sleeve Seals for Electronic Safety and Security Pathways and Cabling
Section 281300	Access Control
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Section 283000	Access Control System
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DIVISION 31 – EARTHWORK (Bid Package 1)

NOT USED

DIVISION 32 – EXTERIOR IMPROVEMENTS

Section 321216	Asphalt Paving
Section 321313	Concrete Paving
Section 321316	Decorative Concrete Paving
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Section 321400	Unit Paving
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Section 329223	Sodding
Section 329300	Plants

DIVISION 33 – UTILITIES (Bid Package 1)

NOT USED

END OF TABLE OF CONTENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work under separate contracts.
4. Access to site.
5. Coordination with occupants.
6. Work restrictions.
7. Specification and drawing conventions.
8. Miscellaneous provisions.

B. Related Requirements:

1. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Marian University Alumni Hall. RATIO Project Number 12103.000.

1. Project Location: Marian University; 3200 Cold Spring Road, Indianapolis, IN 46222

B. Owner: Marian University.

1. Owner's Address/Contact: Audra Blasdel, Director of Projects and Procurement; 3200 Cold Spring Road, Indianapolis, IN 46222. Phone: 317-955-6254.

C. Architect: RATIO Architects, Inc., 107 S. Pennsylvania Street, Indianapolis, IN 46204.

1. Architect’s Contact: Kevin Huse, 317-633-4040.

D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Structural Engineer: FRP, Inc..
2. Plumbing, Mechanical and Electrical Engineer: R. E. Dimond and Associates.
3. Civil Engineer: Snelling Engineering.
4. Landscape Architecture: RATIO Architects, Inc..

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Work consists of new construction of a new one story facility of approximately 19,000 gsf, comprised of curtain walls and store front aluminum wall systems, some additional structural

steel, masonry, stone, metal wall and soffit systems, membrane roofing, metal trim and fascia, metal stud and drywall construction interiors, metal door frames, metal and wood doors, kitchen equipment, toilet fixtures and accessories, mechanical, plumbing fire protections and electrical systems to complete the mew construction. Site and utility work, along with building foundations and most of the structural steel for the project have already been bid and are included in Bid Package 1 – the successful contractors for Bid Package 2 are required to coordinate their building systems accordingly with the first Bid Package.

B. Type of Contract:

1. Project will be constructed under a multiple contracts assigned to the Construction Manager, Wilhelm Construction.

1.5 WORK BY OWNER

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

1.6 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes coordinating and installing blocking, and installing the owner furnished equipment where indicated.

B. Owner-Furnished Products:

1. As indicated on the Drawings and/or in the Project Manual.

1.7 ACCESS TO SITE

A. General: Contractor shall have unlimited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.8 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 7:00 a.m. to 7:00 p.m., Monday through Friday, unless otherwise indicated.

1. Weekend Hours: As approved by the Owner and authorities having jurisdiction.
2. Hours for Utility Shutdowns and Noise Producing Activities: As approved by the Owner.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.

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

1.9 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

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 published as part of the U.S. National CAD Standard and scheduled on Drawings.
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 011000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit an electronic copy 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 CSI Form 13.1A.
2. Documentation: Show compliance with requirements for substitutions and the following:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, 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. **Contractor proposing the substitution will be required to pay for any additional costs discovered or not planned on due to the substitution that impacts any other Contract or material on the project that is a direct result or impact of the substitution**.
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 through Construction Manager 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.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on 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. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.

e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue through Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions" or similar document.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Construction Manager will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Construction Manager are not instructions either to stop work in progress or to execute the proposed change.
2. Within 15 business 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 CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail."

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 Construction Manager.

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 Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use CSI Form 13.6A, "Change Order Request (Proposal)," with attachments CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail."

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See the Bid Manual for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

B. Unit-Price Adjustment: See the Bid Manual for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Construction Manager will issue a Change Order for signatures of Owner and Contractor on AIA Document G701 or similar document.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Construction Manager may issue a Construction Change Directive on AIA Document G714, or similar document. 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 012600

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Requirements:

1. Refer to Bid Manual for procedural requirements governing the handling and processing of allowances.
2. Refer to Bid Manual for administrative requirements governing the use of unit prices.
3. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
4. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

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

1.4 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 other required administrative forms and schedules, including the following:

   a. Application for Payment forms with continuation sheets.
   b. Submittal schedule.
   c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Architect through Construction Manager at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract as described in Section 011000 "Summary."

B. Format and Content: Use 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 Construction Manager.
    c. Name of Architect.
    d. Architect's project number.
    e. Contractor's name and address.
    f. 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.

        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 Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

    a. Include separate line items under Contractor and principal subcontracts for LEED documentation and other Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. 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.
9. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

11. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and Construction Manager 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.

C. Payment Application Times: Submit Application for Payment to Architect by the 25th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

1. Submit draft copy of Application for Payment five days prior to due date for review by Architect.

D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager 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.

F. 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.

G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Construction Manager by a method ensuring receipt within 24 hours. 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.

H. 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.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

I. 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. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Schedule of unit prices.
7. Submittal schedule (preliminary if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
12. Initial progress report.
13. Report of preconstruction conference.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Data needed to acquire Owner's insurance.

J. Application for Payment at Substantial Completion: After Architect issues 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 Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

K. Final Payment Application: After completing Project closeout requirements, 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, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "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 012900

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Coordination Drawings.
3. Administrative and supervisory personnel.
4. Project meetings.
5. Requests for Information (RFIs).

B. **Each contractor shall participate in coordination requirements.** Certain areas of responsibility will be assigned to a specific contractor.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
2. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking information, interpretation or clarification of the Contract Documents.

1.4 COORDINATION

A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with 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 with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service and repair of all components, including mechanical and electrical.

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.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.5 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings as it relates to products being installed – that may or may not conflict with other products being installed on the project – **prior to any production and/or installation of products**.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

   a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical and electrical systems.
   b. Indicate required installation sequences.
   c. Comply with Requirements of Division 1 Section “Submittal Procedures.”
   d. Refer to Division 21 through 28 Sections for specific Coordination Drawing requirements for mechanical and electrical installations.
   e. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 11 by 17 inches but no larger than 30 by 42 inches.
3. Number of Copies: Submit Electronic copies of each submittal through Construction Manager, who will return a marked-up or reviewed response from design team of said Electronic copy.
4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

B. Key Personnel Names: Within fifteen (15) calendar 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 telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other contractors.

1.7 PROJECT MEETINGS

A. General: Attend and participate in meetings and conferences at Project site,unless otherwise indicated.

1. Attendees: Construction Manager will inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Comply with Construction Managers scheduled meeting dates and times.
2. Agenda: Construction Manager will prepare the meeting agenda and distribute the agenda to all invited attendees.
3. Minutes: Construction Manager will record significant discussions and agreements achieved and distribute the meeting minutes to everyone concerned, including Owner, Architect, and Contractors, within seven (7) calendar days of the meeting.

B. Preconstruction Conference: Construction Manager will schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than fifteen (15) working days after execution of the Agreement. The conference will be held at Project site or another convenient location. Construction Manager will conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All 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. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for Requests for Information (RFIs).
    g. Procedures for testing and inspecting.
    h. Procedures for processing Applications for Payment.
    i. Distribution of the Contract Documents.
    j. Submittal procedures.
    k. LEED requirements.
    l. Preparation of Record Documents.
    m. Use of the premises, staging and site utilization.
    n. Owner’s occupancy requirements.
    o. Responsibility for temporary facilities and controls.
    p. Parking availability.
    q. Construction waste management and recycling.
    r. Office, work, and storage areas.
    s. Equipment deliveries and priorities.
    t. Safety procedures and first aid.
    u. Security.
    v. Progress cleaning and housekeeping procedures.
    w. Working hours and work restrictions.
    x. Contract closeout procedures.
    y. Infection control.

3. Reporting: Construction Manager 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 and Construction Manager, 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 Requests for Information (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 of 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 parties who should have been present.
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: Construction Manager will conduct progress meetings at approximately once every two weeks intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner, Construction Manager, 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 conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Construction Manager will review and correct or approve minutes of previous progress meeting, review other items of significance that could affect progress and include topics for discussion as appropriate to status of Project.

a. Construction Manager'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 Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Construction Manager will 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) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Requests for Information (RFIs).
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

3. Reporting: Construction Manager will distribute minutes of the meeting to each party present and to parties who should have been present.

a. Schedule Updating: Construction Manager will revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized and issue revised schedule concurrently with the report of each meeting.

E. Coordination Meetings: Construction Manager will conduct Project Coordination Meetings at intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of the Construction Manager 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 conference shall be familiar with Project and authorized to conclude matters relating to the Work
2. Agenda: Construction Manager will review and correct or approve minutes of the previous coordination meeting, review other items of significance that could affect progress and include topics for discussion as appropriate to status of Project.

a. Construction Manager's Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Construction Manager's Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions

are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Schedule Updating: Construction Manager will revise Construction Manager'sCombined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized and issue revised schedule at the next meeting.

c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.

3. Reporting: Construction Manager will record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.8 REQUESTS FOR INFORMATION (RFIs)

A. Procedure: Immediately on discovery of the need for information or interpretation of the Contract Documents, and if not possible to request information at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned 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 and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Architect and Construction Manager.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and return it. Allow seven (7) working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for coordination information already indicated in the Contract Documents.
d. Requests for adjustments in the Contract Time or the Contract Sum.
e. Requests for interpretation of Architect's actions on submittals.
f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
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 1 Section "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within ten (10) calendar days of receipt of the RFI response.

E. On receipt of Architect's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven (7) calendar days if Contractor disagrees with response.

F. RFI Log: Construction Manager will prepare, maintain, and submit a tabular log of RFIs organized by the RFI number, and will distribute log at each progress meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

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

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF electronic file.

B. Startup construction schedule.

1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated by the Construction Manager, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

F. Construction Schedule Updating Reports: Submit with Applications for Payment.

G. Daily Construction Reports: Submit at weekly intervals.

H. Material Location Reports: Submit at weekly intervals.

I. Site Condition Reports: Submit at time of discovery of differing conditions.

J. Special Reports: Submit at time of unusual event.

K. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "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 phasing, work stages, and interim milestones.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate assigned 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, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. 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.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect or Construction Manager.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.

5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
    l. Building flush-out.
    m. Startup and placement into final use and operation.

7. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Structural completion.
    b. Temporary enclosure and space conditioning.
    c. Permanent space enclosure.
    d. Completion of mechanical installation.
    e. Completion of electrical installation.
    f. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

1. Use one of the following approved by the Construction Manager: Microsoft Project, Meridian Prolog, Scheduling component of Project Web site software specified in Section 013100 "Project Management and Coordination," for current Windows operating systems.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 21 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a cost- and resource-loaded, 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 60 days after date established for commencement of the Work.

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 coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.
    i. Testing and commissioning.
    j. Punch list and final completion.
    k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, LEED documentation, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.

    a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
    b. Total cost assigned to activities shall equal the total Contract Sum.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.3 REPORTS

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

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

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.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. 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.
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.

B. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

END OF SECTION 013200

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Requirements:

1. Division 1 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Division 1 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Division 1 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 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."

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with 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. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals, if requested.

1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.

a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
b. Digital Drawing Software Program: The Contract Drawings are available in DWG format or in REVIT Model Format, and will be controlled and copies issued by Wilhelm Construction.
c. Contractor shall execute a Waiver of Claims agreement in the form provided by the Architect and the Construction Manager.

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 different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.

1. Initial Review: Allow 15 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Re-submittal Review: Allow 15 calendar days for review of each re-submittal.

4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 21 calendar days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file 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.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.001). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.001.R).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software or electronic form acceptable to Owner**,** containing the following information:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of firm or entity that prepared submittal.
    g. Names of subcontractor, manufacturer, and supplier.
    h. Category and type of submittal.
    i. Submittal purpose and description.
    j. Specification Section number and title.
    k. Specification paragraph number or drawing designation and generic name for each of multiple items.
    l. Drawing number and detail references, as appropriate.
    m. Location(s) where product is to be installed, as appropriate.
    n. Related physical samples submitted directly.
    o. Indication of full or partial submittal.
    p. Submittal and transmittal distribution record.
    q. Other necessary identification.
    r. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

    a. Project name.
    b. Number and title of appropriate Specification Section.
    c. Manufacturer name.
    d. Product name.

E. Options: Identify options requiring selection by Architect.

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

G. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

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

1. Submit electronic submittals via email as PDF electronic files.

    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: Architect will return or post one electronic copy.
3. Informational Submittals: Architect will not return copies.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark submittal to show which products and options are applicable, if not properly indicated, the submittal will be rejected.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.

f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in PDF electronic format.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, 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. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
3. Submit Shop Drawings in PDF electronic format.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of applicable Specification Section.
e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples 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 three sets of Samples. Architect will retain one Sample sets; remainder will be returned. 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.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in PDF electronic format.

F. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

G. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

I. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

J. 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.

K. 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.

L. 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.

M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

O. 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.

P. 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.

Q. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

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

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Both Contractor and Construction Manager are to 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. Both are to mark with their respective approval stamps before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

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

3.2 ARCHITECT'S ACTION

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

B. 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. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This 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. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:

1. Division 1 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
2. Divisions 2 through 16 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.

D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 DELEGATED DESIGN

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.

1.5 SUBMITTALS

A. Qualification Data: 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.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, 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, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

D. Reports: Prepare and submit certified written reports that 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. Ambient 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.

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

1.6 QUALITY ASSURANCE

A. 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.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. 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.

D. 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.

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 sections of the Specifications 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. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.

1. Contractor responsibilities include the following:

a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
d. When testing is complete, remove assemblies; do not reuse materials on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

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.
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.

1.7 QUALITY CONTROL

A. Owner Responsibilities: The 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 the 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.

B. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.

1. Testing agency will notify Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
5. Testing agency will retest and reinspect corrected work.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

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 revised or replaced Work that failed to comply with requirements established by the Contract Documents.

E. 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.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 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 Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.

B. Protect construction exposed by or for quality-control service activities.

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

END OF SECTION 014000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 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": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

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.

1.3 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.

1.4 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 Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Industry Organizations: 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. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association (The) www.aluminum.org	(703) 358-2960
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists www.aatcc.org	(919) 549-8141
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	American Concrete Institute www.concrete.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AHRI	Air-Conditioning, Heating, andRefrigeration Institute, The	(703) 524-8800

	www.ahrinet.org	
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(405) 780-7372
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International	(800) 843-2763

	(American Society of Mechanical Engineers International) www.asme.org	(973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
ATIS	Alliance for Telecommunications Industry Solutions www.atis.org	(202) 628-6380
AWCMA	American Window Covering Manufacturers Association (Now WCMA)	
AWCI	Association of the Wall and Ceiling Industry www.awci.org	(703) 534-8300
AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association) www.awpa.com	(205) 733-4077
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI, Inc. www.bicsi.org	(800) 242-7405 (813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(866) 342-4772
CCC	Carpet Cushion Council www.carpetcushion.org	(610) 527-3880
CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association	(613) 230-9263

	www.canelect.ca	
CEA	Consumer Electronics Association www.ce.org	(866) 858-1555 (703) 907-7600
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CPA	Composite Panel Association www.pbmdf.com	(703) 724-1128
CRI	Carpet and Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200 (800) 328-6306
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CSA	Canadian Standards Association www.csa.ca	(800) 463-6727 (416) 747-4000
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(866) 797-4272 (416) 747-4000
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
DHI	Door and Hardware Institute	(703) 222-2010

	www.dhi.org	
ECA	Electrical Components Association www.ec-central.org	(703)907-8024
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee http://content.asce.org/ejcdc/	(703) 295-6000
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association (Electrostatic Discharge Association) www.esda.org	(315) 339-6937
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA) www.intertek-etlsemko.com	(800) 967-5352
FIBA	Federation Internationale de Basketball (The International Basketball Federation) www.fiba.com	41 22 545 00 00
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation) www.fivb.ch	41 21 345 35 35
FM Approvals	FM Approvals LLC www.fmglobal.com	(781) 762-4300
FM Global	FM Global (Formerly: FMG - FM Global) www.fmglobal.com	(401) 275-3000
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridaroof.com	(407) 671-3772
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0
GA	Gypsum Association www.gypsum.org	(301) 277-8686
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208

GRI	(Part of GSI)	
GS	Green Seal www.greenseal.org	(202) 872-6400
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HI/GAMA	Hydronics Institute/Gas Appliance Manufacturers Association Division of Air-Conditioning, Heating, and Refrigeration Institute (AHRI) www.ahrinet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAPSC	International Association of Professional Security Consultants www.iapsc.org	(515) 282-8192
ICBO	International Conference of Building Officials www.iccsafe.org	(888) 422-7233
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
ICPA	International Cast Polymer Association www.icpa-hq.org	(703) 525-0320
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IES	Illuminating Engineering Society of North America www.iesna.org	(703) 525-0320
IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc.	(812) 275-4426

	www.iliai.com	
ISA	Instrumentation, Systems, and Automation Society, The www.isa.org	(919) 549-8411
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (801) 341-7360
ITS	Intertek Testing Service NA (Now ETL SEMCO)	
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LGSEA	Light Gauge Steel Engineers Association www.arcat.com	(202) 263-4488
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MCA	Metal Construction Association www.metalconstruction.org	(847) 375-4718
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(888) 480-9138
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MH	Material Handling (Now MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937 (604) 298-7578
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613

NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(630) 942-6591
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6223 (281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAGWS	National Association for Girls and Women in Sport www.aahperd.org/nagws/	(800) 213-7193, ext. 453
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCAA	National Collegiate Athletic Association (The) www.ncaa.org	(317) 917-6222
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 222-2300
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (269) 488-6382
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association	(866) 342-5642

	www.glass.org	(703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association) www.nofma.org	(901) 526-5016
NOMMA	National Ornamental & Miscellaneous Metals Association www.nomma.org	(888) 516-8585
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736 (540) 751-0930
NWFA	National Wood Flooring Association www.nwfa.org	(800) 422-4556 (636) 519-9663
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute http://pgi-tp.cee.uiuc.edu	(217) 333-3929
PTI	Post-Tensioning Institute www.post-tensioning.org	(248) 848-3180
RCSC	Research Council on Structural Connections www.boltcouncil.org	
RFCI	Resilient Floor Covering Institute www.rfci.com	 (706) 882-3833
RIS	Redwood Inspection Service www.redwoodinspection.com	 (925) 935-1499
SAE	SAE International	(877) 606-7323

	www.sae.org	(724) 776-4841
SCAQMD	South Coast Air Quality Management District www.aqmd.com	(909) 396-2000
SCTE	Society of Cable Telecommunications Engineers www.scte.org	(800) 542-5040 (610) 363-6888
SDI	Steel Deck Institute www.sdi.org	(847) 458-4647
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(877) 294-5424 (516) 294-5424
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)	
SIA	Security Industry Association www.siaonline.org	(866) 817-8888 (703) 683-2075
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SMPTE	Society of Motion Picture and Television Engineers www.smpte.org	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265

SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWPA	Submersible Wastewater Pump Association www.swpa.org	(847) 681-1868
TCA	Tilt-Up Concrete Association www.tilt-up.org	(319) 895-6911
TCNA	Tile Council of North America, Inc. www.tileusa.com	(864) 646-8453
TEMA	Tubular Exchanger Manufacturers Association www.tema.org	(914) 332-0040
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute, Inc. www.tpinst.org	(703) 683-1010
TPI	Turfgrass Producers International www.turfgrasssod.org	(800) 405-8873 (847) 649-5555
TRI	Tile Roofing Institute www.tileroofing.org	(312) 670-4177
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USAV	USA Volleyball www.usavolleyball.org	(888) 786-5539 (719) 228-6800
USGBC	U.S. Green Building Council www.usgbc.org	(800) 795-1747
USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association www.wcmanet.org	(212) 297-2122

WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (312) 321-6802
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 570-5441
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

C. 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. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

DIN	Deutsches Institut fur Normung e.V. www.din.de	49 30 2601-0
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543

D. 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. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

COE	Army Corps of Engineers www.usace.army.mil	(202) 761-0011
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense http://dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220

EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Buildings Service (See GSA)	
PHS	Office of Public Health and Science http://www.hhs.gov/ophs/	(202) 690-7694
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board http://gulliver.trb.org	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USP	U.S. Pharmacopeia www.usp.org	(800) 227-8772
USPS	Postal Service www.usps.com	(202) 268-2000

E. 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. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil/	(215) 697-2664
	Available from Defense Standardization Program www.dsp.dla.mil	
	Available from General Services Administration www.gsa.gov	(202) 619-8925
	Available from National Institute of Building Sciences www.wbdg.org/ccb	(202) 289-7800
FTMS	Federal Test Method Standard (See FS)	
MIL	(See MILSPEC)	
MIL-STD	(See MILSPEC)	
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080

F. 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. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBHF	State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation www.dca.ca.gov/bhfti	(800) 952-5210 (916) 574-2041
CCR	California Code of Regulations www.calregs.com	(916) 323-6815
CDHS	California Department of Health Services www.dhcs.ca.gov	(916) 445-4171
CDPH	California Department of Public Health, Indoor Air Quality Section www.cal-iaq.org	
CPUC	California Public Utilities Commission www.cpuc.ca.gov	(415) 703-2782
TFS	Texas Forest Service Forest Resource Development http://txforestservice.tamu.edu	 (979) 458-6606

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 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 to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

E. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

F. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

G. Sewer, Water, and Electric Power Service: Use charges are specified in Section 011200 "Multiple Contract Summary."

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
3. 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.

E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste handling procedures.
5. Other dust-control measures.

1.5 QUALITY ASSURANCE

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

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 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.

B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; 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 and bottom rails. Provide galvanized-steel bases for supporting posts.

C. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel office activities.

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.

2.3 EQUIPMENT

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

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".

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 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.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: 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.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service underground unless otherwise indicated.

H. 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.
2. Install lighting for Project identification sign.

I. Telephone Service: Construction Manager will provide temporary telephone service in common-use facilities for use by all construction personnel. However, if the contractor is providing their own trailer on site, they will need to install telephone lines for their own field office.

1. Provide additional telephone lines for the following:

a. Provide a dedicated telephone line for each facsimile machine in each field office.

2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

J. Electronic Communication Service: Provide a desktop computer and all supporting equipment, such as printers, copiers, etc., in the primary field office adequate for use so as to allow communication with the Architect and Owner.

3.3 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 Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

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

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving."
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.

D. 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.

E. Parking: Provide temporary parking areas for construction personnel.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

    a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touchup signs so they are legible at all times.

H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

I. 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.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."

D. 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 erosion- and sedimentation-control Drawings.

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.

E. Storm Water 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.

F. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."

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

H. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations, or as shown on the drawings.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

3.5 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. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.

D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Division 1 Section "Substitution Procedures" for requests for substitutions.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature 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.

1.4 ACTION SUBMITTALS

A. 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. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. 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 Section 013300 "Submittal Procedures."

b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

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

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

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

1.7 PRODUCT WARRANTIES

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

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

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," 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 requirements. 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 not 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 not 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 Section 012500 "Substitution Procedures" for proposal of product.

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

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: 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:

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.
6. Submit with the Comparable Products form at the end of this Section.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

To _____ Date: _____

Project _____

PART 1 - We hereby submit for your consideration the following product instead of the specified item(s) for the above project:

Section	Article/Paragraph (Page)	Specified Item

Proposed
Substitution: _____ Model: _____

Manufacturer: _____ Phone: _____

Attach complete technical data including laboratory tests if applicable.

PART 2 - Include complete information changes to Drawings and/or Specifications which proposed substitution require for proper installation.

Fill in Blanks Below, use additional sheets if necessary:

A. Does the substitution affect dimensions shown on Drawings?

_____

B. Will the undersigned pay for changes to building design, including engineering and detailing costs caused by substitution, if any?

_____

C. What effect does substitution have on other trades?

_____

D. Differences between proposed substitution and specified item?

_____

E. Manufacturer's guarantees of proposed and specified items are:

_____Same _____Different (explain on attachment)

PART 3 - The undersigned certifies that the function, appearance and quality are equivalent or superior to the specified item.

Submitted By:

_____
Signature

_____

Firm _____

Address _____

Telephone _____Fax _____

For Use by Design Consultant:

Accepted Accepted as Noted

Not Accepted Received too Late

PM _____ Specifier _____

Date _____

Remarks_____

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. General installation of products.
3. Progress cleaning.
4. Starting and adjusting.
5. Protection of installed construction, including underground campus utilities.
6. Correction of the Work.

B. Related Sections include the following:

1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 1 Section "Submittal Procedures" for submitting surveys.
3. Division 1 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
4. Division 1 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.

1.3 QUALITY ASSURANCE

A. Progress Inspections and Observations: Progress inspections during construction will be conducted by assigned University personnel to verify that construction is in compliance with Contract Documents and authorities having jurisdiction. Architect and his Consultants will provide additional observations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

B. Acceptance of Conditions: 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. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a. Description of the Work.
b. List of detrimental conditions, including substrates.

c. List of unacceptable installation tolerances.
d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on "Request for Information" form supplied by Architect.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

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.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

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

1. Prior to submitting Final Application for Payment, each Prime Contractor shall provide written certification on Contractor's letterhead stating that all Contractor-provided materials and equipment included in the Work are free of asbestos.

3.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. 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 materials on site more than seven (7) calendar days during normal weather or three (3) calendar 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.
4. Contractors shall provide appropriate waste containers for trash adjacent to all drinking water sources.

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.
3. Clean interior areas prior to start of surface finishing and continue cleaning as required.

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. Control cleaning operations so that dust and other air-borne particles do not adhere to wet or newly coated surfaces.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

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: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.7 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.

1. Do not expose installed devices, equipment or systems to construction conditions that will hinder their proper operation or performance, or shorten their useful life.
2. Do not expose installed finishes or furnishings to construction conditions that will mar their appearance or shorten their useful life.

B. Comply with manufacturer's written instructions for temperature and relative humidity requirements for installation and post-installation conditions.

C. Protection of Existing Underground Utilities: A network of existing underground utilities, pipelines, tunnels, manholes, duct banks and electrical conduit may be present in and around Project site. Contractor shall become familiar with the extent and location of these underground utilities and structures and protect them from damage caused by construction operations.

1. Exercise care to protect underground utilities from heavy vehicular traffic and provide mud-mats where required.

D. The Contractor shall not operate valves, switches or other controls of any existing utility system for any purpose without written approval by the Owner. Comply with Owner’s lockout-tagout procedures.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

F. Repair any damage to existing underground utilities located in the field or indicated on the Drawings to utility owner's satisfaction.

1. Cost for repair shall be solely at Contractor's expense without cost to Owner, including the cost of repairing sitework, pavement, walks and other site elements.
2. Owner reserves the right to repair any existing utility damage at Contractor's expense, and at Owner's sole discretion, to require repair or replacement.
3. Where utility damage requires a service interruption, Contractor shall work continuously on a 24-hour, 7 days per week schedule until damaged utility is placed in service. All associated costs thereof shall be borne by Contractor.

END OF SECTION 017300

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Divisions 2 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

C. Cutting and patching shall be the responsibility of the trade or contractor requiring such work.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least ten (10) working days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

1. Obtain approval of proposed cutting and patching before cutting and patching the following structural elements, **if applicable**:

a. Structural steel.
b. Lintels.
c. Structural decking.
d. Structural wood framing.
e. Structural concrete.
f. Miscellaneous structural metals.

B. 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. Operating elements **may** include the following:

1. Primary operational systems and equipment.
2. Air or smoke barriers.
3. Mechanical systems piping and ducts.
4. Control systems.
5. Communication systems.
6. Electrical wiring systems.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related 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.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials 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 match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect 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.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, including piping, conduit and ductwork, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut 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. 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 as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Portions of masonry walls noted to be removed and openings to be cut into masonry walls shall be removed back to the nearest vertical mortar joint. Provide a minimum bearing of 8" at each end for new masonry lintels and field verify final length. Allow a minimum of 4" new masonry at jamb conditions or end wall conditions of masonry walls.
5. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
6. 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.
7. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang 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 weather-tight condition.
6. Pipe Covering: Restore pipe covering to pre-construction condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
2. Division 1 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 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.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1.6 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.
5. Submit test/adjust/balance records.
6. 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 Section 017900 "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.
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. Re-inspection: Request re-inspection 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.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "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.

B. Inspection: Submit a written request for final inspection to determine acceptance 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 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. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 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] [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. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:

    a. MS Excel electronic file. Architect will return annotated file.

1.9 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. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of 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.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

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

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for 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. 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 and similar equipment. Remove excess lubrication, paint and mortar droppings, 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 ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
q. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

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 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 017700

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Requirements:

1. Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 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. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 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 has 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.

2.2 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

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

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

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

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

2.3 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

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

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

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

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

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

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Section 017839 "Project Record Documents."

D. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, 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.

1.3 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 using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For [**facilitator**] [**instructor**] [**videographer**].

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit [**two**] <**Insert number**> copies within [**seven**] <**Insert number**> days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Date of video recording.

2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.

3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
4. At completion of training, submit complete training manual(s) for Owner's use [**prepared and bound in format matching operation and maintenance manuals**] [**in PDF electronic file format on compact disc**].

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. 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

2.1 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

3.1 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 Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. 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.

C. 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[**, through Architect,**][**, through Construction Manager,**] with at least [**seven**] <**Insert number**> days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of [**an oral**] [**a written**] [**a demonstration**] performance-based test.

F. Cleanup: Collect used and leftover educational materials and [**remove from Project site**] [**give to Owner**]. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to [**.mp4 format file type**] [**format file type acceptable to Owner**], on electronic media.

1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

    a. Produce segments to present a single significant piece of equipment per segment.
    b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by [**audio narration by microphone while**] [**dubbing audio narration off-site after**] video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 017900

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Materials, equipment and labor required for placing, finishing and curing all cast-in-place concrete.

B. Installation of all specified items to be embedded in cast-in-place concrete.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 051200 - Structural Steel Framing: Anchor bolts, items to be embedded in cast-in-place concrete.

1.3 RELATED SECTIONS

A. Section 031100 - Concrete Forming.

1.4 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

B. ACI 305 - Hot Weather Concreting.

B. ACI 306 - Cold Weather Concreting.

C. ACI 318 - Building Code Requirements for Reinforced Concrete.

D. ASTM C31 - Making and Curing Concrete Test Specimens in the Field.

E. ASTM C33 - Concrete Aggregates.

F. ASTM C39 - Test for Compressive Strength of Cylindrical Concrete Specimens.

G. ASTM C42 - Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

H. ASTM C94 - Ready-Mixed Concrete.

I. ASTM C143 - Test for Slump of Portland Cement Concrete.

J. ASTM C150 - Portland Cement.

K. ASTM C171 - Sheet Materials for Curing Concrete.

L. ASTM C172 - Sampling Fresh Concrete.

M. ASTM C173 - Test for Air Content of Freshly Mixed Concrete by the Volumetric Method.

N. ASTM C231 - Test for Air Content of Freshly Mixed Concrete by the Pressure Method.

O. ASTM C260 - Air-Entraining Admixtures for Concrete.

P. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

Q. ASTM C494 - Chemical Admixtures for Concrete.

R. ASTM C618 - Fly Ash and Raw or Calcined Natural Pozzolans for Use in Portland Cement Concrete.

S. ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

T. Indiana Department of Highways - Standard Specifications.

U. ASTM E1155 - Standard Test Method for Determining Floor Flatness and Levelness Using the F-Numbers System.

1.5 SUBMITTALS

A. Concrete Mix Designs:

1. Submit a mix design for each class of concrete required for the project under the provisions of Division 1 and including:

a. Standard deviation analysis, required average strength and documentation of average strength verifying compliance with ACI 318.
b. Mix proportions by weight, water-cement ratio, slump and air content.
c. Sieve analyses of fine and coarse aggregates.
d. Complete list of materials specified in Article 2.1 with product information demonstrating compliance with all specified requirements.

2. Submit with sufficient time allowed for review before concrete is required for the project.

B. Shop Drawings:

1. Submit complete shop drawings under the provisions of Division 1 and indicating:

a. Locations of construction joints in supported levels.
b. Sizes and locations of sleeves.
c. Locations of waterstops.

C. Product Information: Submit product information for materials specified in Article 2.2 under the provisions of Division 1 and demonstrating compliance with specified requirements.

D. Field Quality Control Test Reports: Submit to the Architect/Engineer under the provisions of Division 1 and within 3 days after completion of the 7-day and 28-day tests.

E. Slab finish tolerance compliance test reports as specified in Article 3.5A.

F. Concrete Placement Records: Turn over to the Architect/ Engineer after completion of the project.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Conduct field sampling and testing of concrete, including the making of test specimens, with personnel holding current certificates issued by the Concrete Technician Certification Committee of ACI.

C. The Contractor shall attend a preconstruction meeting to discuss submittals, concrete placement, and concrete testing. A responsible representative of the concrete placing/finishing contractor, the concrete supplier, and the testing laboratory shall be present.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver concrete in accordance with ASTM C94. Do not use non-agitating transporting equipment.

B. Deliver materials and equipment in undamaged condition.

C. Store materials and equipment in designated areas and in accordance with manufacturer's instructions.

D. Store materials and equipment off the ground, totally protected from ground splash, mud, weather separation, intrusion of foreign materials, and other damage.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Inclement Weather: Do not place concrete during rain, sleet or snow unless adequate protection is provided.

B. Hot Weather: Perform work under provisions of Article 3.10.

C. Cold Weather: Perform work under provisions of Article 3.11.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland Cement: ASTM C150, Type I or Type III.

B. Flyash: ASTM C618, Class C or Class F.

1. Maximum loss on ignition: 3.0 percent.
2. Maximum amount retained when wet-sieved on No. 325 sieve: 30 percent.

C. Slag Cement: ASTM C989, Grade 120.

D. Fine Aggregate: ASTM C33.

1. Natural sand of clean, hard, durable particles.
2. Indiana Department of Highways, Standard Specifications, Size #23.

E. Coarse Aggregate: ASTM C33.

1. Crushed stone or gravel of clean, sound, tough, durable particles.

    a. For air-entrained concrete mixes: ASTM C33, Class 4S.
    b. For non air-entrained concrete mixes: ASTM C33, Class 2S.

2. Indiana Department of Highways, Standard Specifications, Class A, Size 8, 3/4 inch maximum size.

F. Water: Clean and free from injurious amounts of oil, acids, alkalis, salts, organic materials and other deleterious substances.

G. Air-Entraining Admixture: ASTM C260.

1. Standards:
   a. Micro-Air by Master Builders.
   b. MBAE 90 by Master Builders.
   c. Darex Series by W. R. Grace & Co.
   d. Daravair Series by W. R. Grace & Co.
   e. Air Mix by The Euclid Chemical Co.
   f. AEA 92 by The Euclid Chemical Co.

H. Water-Reducing Admixture: ASTM C494, Type A.

1. Standards:

   a. Pozzolith 122-N by Master Builders.
   b. Pozzolith 322-N or 220-N by Master Builders.
   c. WRDA with Hycol by W. R. Grace & Co.
   d. Eucon WR-75 or Eucon MR by The Euclid Chemical Co.

I. Mid-Range Water Reducing Admixture: ASTM C494, Type A.

1. Standards

   a. Daracem 55 or 65 by W. R. Grace.
   b. Mira by W. R. Grace.
   c. MB MR Polyheed Series 900, 1025, or 997 by Master Builders.

J. High Range Water-Reducing Admixture: ASTM C494, Type F.

1. Standards:

   a. Glenium 3030NS by Master Builders.
   b. Rheobuild 1000 by Master Builders.
   c. Daracem Series by W. R. Grace & Co.
   d. Adva Series by W. R. Grace & Co.
   e. Eucon 37 by The Euclid Chemical Co.
   f. Eucon 537 by The Euclid Chemical Co.

2. High range water reducing admixture shall be added to the concrete at the batch plant. Field added HRWR is allowed to correct slump non-compliance per Article 3.13F.

K. Accelerating Admixture: ASTM C494, Type C.

1. Standards:

   a. Pozzutec 20 or Pozzolith NC534 Accelerator by Master Builders.
   b. Polarset by W. R. Grace & Co.
   c. Accelguard 80 or 90 by The Euclid Chemical Co.

2. The accelerator shall be non-chloride, non-corrosive. Calcium chloride, or admixtures containing more than 0.05% chloride ions are not permitted.

3. Thiocyanate-based accelerators, when used at the given dosage rate, shall contribute thiocyanate ions less than 0.30 percent by weight of cement. This shall be certified by the manufacturer. Thiocyanate based accelerators are not allowed in post-tensioned concrete.

L. Water-Reducing & Retarding Admixture: ASTM C494, Type D.

1. Standards:

a. Pozzolith 122-R or Pozzolith 300R by Master Builders.
b. Daratard-17 by W. R. Grace & Co.
c. Eucon Retarder-75 by The Euclid Chemical Co.

M. Corrosion-inhibitor Additive:

1. Calcium nitrite-based corrosion inhibitor.

a. At a dosage rate of 3 gallons per cubic yard, the additive shall provide a minimum chloride protection of 9.9 pounds of chlorides per cubic yard of concrete.
b. The corrosion inhibitor shall contain 30 +/- 2 percent of calcium nitrite by weight.
c. The manufacturer shall submit 5 projects of similar size.

2. Standard:

a. DCI by W.R. Grace and Co.
b. Rheocrete CNI by Master Builders.

N. Synthetic Fibers (for slabs on grade):

1. Virgin (non-recycled), nylon or polypropylene fibers.
2. 3/4 inch length (unless specified otherwise).
3. When using nylon fibers, add fibers at a minimum dosage rate of 1.0 pound/cubic yard. When using fibrillated polypropylene fibers, add fibers at a minimum dosage rate of 1.5 pounds/cubic yard. Use in strict accordance with manufacturer's instructions.
4. Fibers shall be introduced into the concrete at the batch plant, and it shall be noted on all delivery tickets.
5. Standards:

a. Nytech CG by NMW, Inc.
b. Fibermesh 300 by Propex Concrete Systems.
c. Forta Ultramesh by Forta Corp.
d. Nytech PPF by NMW, Inc.

2.2 RELATED MATERIALS

A. Curing Compound: ASTM C309.

1. Clear curing, non-yellowing under ultra violet light.
2. Sodium silicate products are not permitted.
3. Compatible with applied sealers and finishes specified for the concrete surfaces to be cured.
4. Curing compound shall be applied at the coverage rate to comply with ASTM C309.

B. Moisture Retention Cover: ASTM C171.

1. Waterproof paper or polyethylene film.

C. Evaporation Retardant:

1. Apply in accordance with manufacturer's instructions.

2. Standard:

a. Confilm by Master Builders.
b. EUCO-BAR by the Euclid Chemical Co.

D. Epoxy Bonding Adhesive:

1. Two-part structural epoxy adhesive.
2. Use to bond fresh, plastic concrete or patching mortar to hardened concrete.
3. Standards:

a. Sikadur 32, Hi-Mod by Sika Corporation.
b. Euco 452 by The Euclid Chemical Co.

E. Adhesive Anchor System:

1. Moisture insensitive epoxy.
2. Use to anchor reinforcing steel or anchor bolts into hardened concrete.
3. Standards:

a. Hilti HIT HY 150 by Hilti Fastening Systems.
b. Vertical holes: Sikadur 32, Hi-Mod by Sika Corporation or Euco 452MV Epoxy by The Euclid Chemical Co.
c. Horizontal holes: Sikadur Injection Gel by Sika Corporation or Euco Epoxy 620 by The Euclid Chemical Co.
d. Overhead application: Sikadur 31, Hi-Mod Gel by Sika Corporation Euco 452 Gel by The Euclid Chemical Co.
e. Approved equal: submit literature including depth of embedment to develop reinforcing bars/anchor bolts and spacing requirements.

4. Drilled hole size and installation procedure shall conform to manufacturer's instructions.
5. Use carbide bit drill to prevent damage to reinforcement.

F. Patching Material:

1. Use to repair honeycombed and other defective concrete.
2. Standards:

a. SikaTop 122 PLUS (horizontal and vertical surfaces), by the Sika Corporation.
b. SikaTop 123 PLUS (overhead surfaces), by the Sika Corporation.
c. EMACO R310 (horizontal surfaces) by Master Builders, Inc.
d. EMACO R320 (vertical and overhead surfaces) by Master Builders, Inc.

G. Waterstops:

1. PVC flat ribbed or dumbbell type.

a. Provide waterstops with center bulb at all expansion joints and as detailed.
b. Split-fin type waterstop is acceptable at construction joints and expansion joints.
c. Provide all corner joints and tee joints in prefabricated assemblies. Field splices shall be used for butt joints only, using controlled indirect heating element per manufacturer's requirements.
d. Standards:

1) Greenstreak Plastic Products Company.
2) Vinylex Corporation.
3) Wirestop, Paul Murphy Plastics Company.
4) Durajoint, Tamms/Horn

2. Waterstop-RX by American Colloid Company

a. Keep dry at all times.
b. RX101: Use with concrete with two rows of reinforcement and with 3" minimum concrete cover.
c. RX102: Use with one row of reinforcement and with 2" minimum concrete cover.
d. Install in strict accordance with manufacturer's requirements.

I. Self-leveling Underlayment Concrete:

1. Material shall be compatible with floor finishes.
2. Material shall be used on floors that will receive a floor covering.
3. Standards:

a. Ardex K-15 by Ardex Engineered Cements.
b. Level-Right by Gyp-Crete Corp.
c. Flo-Top/Flo-Top 90 by The Euclid Chemical Co.

J. Self-leveling, Polymer Modified Industrial Topping

1. Material shall be compatible with floor sealer.
2. Material shall be used on exposed concrete floors.
3. Standards:

a. Topping 112, by Master Builders.
b. Thin Top/Thin Top Supreme by The Euclid Chemical Co.

K. Sheet Vapor Retarder: A flexible preformed sheer membrane having a water vapor permeance rate no greater than 0.036 perms and is resistant to decay when tested in accordance with ASTM E 154, Section 7 and otherwise conforming to ASTM E 1745, Class C or higher. Virgin polyethylene sheet shall be no less than 10-mils thick in accordance with ACI 302.1R96. **Note that the permeance rate requirement may require a 15-mil product depending on the manufacturer's published test data.**

1. Products: Subject to compliance with requirements, provide the following:

a. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
b. Viper:; Viper II 10-mil.
c. Meadows, W. R., Inc.; Perminator 10 mil.
d. Raven Industries Inc.; Vapor Block 10 mil.
e. Stego Industries, LLC; Stego Wrap 10 mil.

2. Accessories: Include manufacturer's recommended adhesive or pressure-sensitive tape at each overlap joint and seal each penetration per the manufacturers recommendation.
3. Application: Use under all slabs on grade.

2.3 PROPORTIONING CONCRETE MIXES

A. Establish concrete proportions to produce homogeneous, durable mixes with the required average strength based on the appropriate amount of overdesign as required by Section 5.3 of ACI 318.

B. Proportion concrete mixes to provide workability and consistency to permit concrete to be worked readily into the corners and angles of the forms and around reinforcement by the methods of placement and consolidation to be employed, without segregation or excessive bleeding.

C. Include a water-reducing admixture, a mid-range water reducing admixture, or high range water-reducing admixture, used in strict accordance with manufacturer's instructions, in all mix designs. Specified minimum cement contents are based on the use of such admixtures.

D. Include an air-entraining admixture in mix designs for all concrete exposed to freezing and thawing during service.

E. Base mix design on saturated surface dry aggregates. Adjust the amount of mixing water added at the batch plant for the moisture condition of the aggregates.

1. The water-cementitious ratio given for each class of concrete shall be calculated using the amount of Portland Cement plus flyash plus Slag Cement. For Class C flyash, use 100 percent of flyash, and for Class F flyash, use 80 percent of flyash. For Slag Cement, use 100 percent of the Slag Cement.

F. Flyash may be used as a cement substitute with a maximum 20 percent substitution rate on a pound for pound basis for Class C flyash and a maximum 15 percent substitution rate using 1.25 pounds of flyash for 1.00 pound of cement for Class F flyash.

G. Slag Cement may be used as a substitute for Portland Cement on a pound for pound basis. The maximum substitution rate shall be 50%, except for Class D (exterior concrete) and for Class J (structural lightweight concrete). For these classes of concrete, the max substitution shall be 30%.

H. When Slag Cement and flyash are used in the same concrete mix, the maximum substitution rates for Slag Cement and flyash shall comply with the following:

Portland Cement/Slag Cement/Flyash Ratio

Exterior concrete, structural lightweight concrete

(Classes D and J) 70%/20%/10%

All other concrete 50%/30%/20%

I. For concrete to be cast during cold weather (Article 3.11), the maximum substitution rate for Slag Cement shall be 30%. If Slag Cement and flyash are used in the same concrete mix, the maximum substitution rates shall comply with a ratio of Portland Cement/Slag Cement/Flyash of 70%/20%/10%.

J. Water Soluble Chloride Ion Content:

1. Maximum percent in concrete by weight of cement:

a. Post-tensioned concrete: 0.06.
b. Reinforced concrete for water retention structures: 0.10.
c. Reinforced concrete exposed to earth or weather: 0.15.
d. Other reinforced concrete construction: 0.30.

2. For post-tensioned concrete, conduct test to verify compliance with the above requirement. Test samples of the hardened concrete for water soluble chloride ion content at an age of 28 to 42 days using the test procedure contained in AASHTO Method T-260.
3. For each pound of chloride ion in excess of the amount allowed, the mix shall contain a corrosion inhibitor additive at a rate of one gallon for each pound of chloride ion in excess of the amount allowed. A maximum of 1.5 pounds of chloride ion may be compensated in this matter. The minimum dosage shall be one half gallon per cubic yard.

K. Slump:

1. Mixes containing high range water-reducing admixture: 5 to 8 inches.
2. Mixes containing mid-range water-reducing admixture: 5-6 ½ inches.
3. Mixes containing water-reducing admixture: 5 inches maximum.

L. Adjustments to the approved mix designs may be requested by the Contractor when job conditions, weather, test results, or other circumstances warrant. These revised concrete mix designs shall be submitted to the Architect/Engineer for approval prior to their use.

M. Concrete Mix Classes:

1. Class C concrete:

a. Compressive strength at 28 days: 4000 psi.
b. Minimum cement content: 517 lb/cu yd.
c. Maximum water-cementitious ratio: 0.48.
d. Air content: 0 to 3 percent.
e. High range water-reducing admixture required.
f. Synthetic fibers required.

2. Class D concrete:

a. Compressive strength at 28 days: 4000 psi.
b. Minimum cement content: 564 lb/cu yd.
c. Maximum water-cementitious ratio: 0.40.
d. Coarse aggregate: Crushed stone.
e. Air content: 6$\pm$ 1 percent.
f. High range water-reducing admixture required.

2.4 BATCHING AND MIXING

A. Batch and mix concrete in accordance with ASTM C94.

B. Mix concrete until there is a uniform distribution of materials.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install items to be embedded in concrete. Set steel frames, angles, trench drains, bolts, inserts, and other such items required to be anchored in the concrete before the concrete is placed. Position accurately and secure against displacement.

1. Anchor bolts shall be installed in accordance with the tolerances indicated in the AISC Code of Standard Practice, Article 7.5.
2. Do not embed aluminum items in concrete.

B. Remove wood scraps, ice, snow, frost, standing water and debris from areas in which concrete will be placed.

C. Before fresh concrete is placed against hardened concrete, retighten forms and suitably clean and moisten the surface of the hardened concrete for bond to the fresh concrete.

D. Thoroughly moisten subgrade on which concrete is to be placed. Do not place concrete on frozen subgrade.

E. Thoroughly clean conveying and handling equipment.

3.2 SURFACE CONDITIONS

A. Before concrete is placed, inspect the installed work of this and other Sections and verify that all such work is complete.

B. Verify that concrete can be placed to the required lines and elevations with required cover for reinforcement.

C. Prevent groupings of conduits, pipes and sleeves in concrete that would significantly impair the strength of the concrete.

D. Notify the Architect/Engineer when concrete placement is planned. Allow sufficient time for review of formwork, reinforcement and embedded items, and for any required corrective work.

3.3 PLACING

A. Addition of water to the concrete during transport or at the site is strictly prohibited.

B. Convey concrete by methods and equipment capable of supplying concrete from mixer to place of final deposit without segregation and such that detectable setting of concrete does not occur before adjacent concrete is placed.

C. Use pumping equipment with sufficient design and pumping capacity to ensure a practically continuous flow of concrete at the point of discharge without segregation.

1. Do not add water or alter the mix design in any way to facilitate pumping.
2. Pumping concrete through aluminum pipe is prohibited.

D. Do not bear concrete conveying equipment on fresh concrete or reinforcement.

E. After concrete placing has started, provide continuous operation until placement of the section is complete. Do not place a greater section at one time than can be properly finished.

F. Deposit concrete as nearly as practicable to its final position to avoid segregation due to rehandling or flowing.

G. Place concrete at a rate such that the concrete is at all times plastic and flows readily between reinforcement and into corners of forms without segregation.

H. Place concrete in all slabs for the full depth of the member at one time in such a way as to prevent a horizontal cold joint from occurring.

I. All concrete shall be discharged into the structure within 90 minutes after batching.

J. Do not place concrete that has partially hardened, been retempered or contaminated by foreign materials.

3.4 CONSOLIDATION

A. Thoroughly consolidate concrete with high frequency vibrators, working the concrete thoroughly around reinforcement and embedded items and into corners of forms.

B. Use a sufficient number of vibrators, of appropriate size and type, to provide complete vibration throughout the concrete at the same rate it is placed.

1. Provide at least one spare vibrator at the site for use in case of breakdown.

C. Provide properly spaced vibration of duration sufficient to produce complete consolidation, but not long enough to cause segregation. Continue vibration until mortar just begins to puddle at the surface. Remove any excess free water that collects on the surface.

D. Do not use vibrators to transport concrete within forms.

E. Supplement internal vibration with manual consolidation methods and external form vibration as required to produce concrete free of voids, honeycomb and rough surfaces.

1. Vibrate forms in such a way as to avoid form displacement.

3.5 FINISHING SLABS

A. Tolerances:

1. Finish level slabs to conform to the following F-numbers. These are minimum values that pertain to each pour.

a. Slabs on grade
FF = 25
FL = 20

2. Compliance tests shall comply with Article 3.13 H.
3. Remedial work in areas of non-compliance may be required at the Owner's request. This work shall be accomplished by using a self-leveling underlayment concrete or by using a self-leveling, polymer modified industrial topping per Article 2.2.

B. Screeding:

1. Immediately after placing, strike off excess concrete with a straightedge to bring the top surface to proper grade, aligning it to the contours of screeds.
2. Screed off edge forms, intermediate screed strips or pipe set accurately and firmly to the required elevations and contours for the finished surface.
3. Move straightedge across the concrete surface with a sawing motion, advancing forward a short distance with each movement. There should be a surplus of concrete against the front face of the straightedge to fill in low areas as the straightedge passes over the surface.
4. Complete screeding before any excess moisture or bleeding water is present on the surface.

C. Bull Floating or Leveling:

1. Immediately after screeding, bull float the concrete surface, eliminating high and low spots, smoothing the surface and embedding the coarse aggregate.
2. Avoid overworking the concrete. Do not close up or seal the surface of the concrete.
3. Complete bull floating before any excess moisture or bleeding water is present on the surface.

D. Floating:

1. Begin floating operations when bleeding water has disappeared or been removed from the surface and when the surface has stiffened sufficiently to support the operation.

    a. Do not use dry cement and sand to take up bleeding water.

2. Hand or power float the concrete surface, removing slight imperfections and producing a relatively even and true surface with a uniform, sandy texture prepared for final finishing.
3. Avoid overworking the concrete. Do not close up or seal the surface of the concrete.

E. Final Finishing:

1. Hard Trowel Finish: All slabs unless otherwise specified.

    a. Immediately after floating, use power trowel for first trowelling to produce a smooth surface relatively free of defects.
    b. For first trowelling, use hand trowelling in areas inaccessible to power trowelling.
    c. Use hand trowel and heavy pressure for final trowelling after concrete has become hard enough to produce a ringing sound as the trowel is moved over the surface. Produce a smooth, hard, dense surface, uniform in texture and appearance and free of defects.

2. Broom Finish: Slip-resistant surfaces.

    a. Immediately after floating, draw a broom across the concrete surface transversely to the main direction of traffic, producing a coarse, scored, slip-resistant texture.

3.6 FINISHING FORMED SURFACES

A. Rough Form Finish: All formed concrete surfaces not exposed to public view.

1. After being cleaned and thoroughly dampened, fill tie holes solid with patching mortar matching the color of the surrounding concrete.
2. Patch defective areas in accordance with Article 3.7.

3. Chip or rub off fins and projections as follows:

    a. For wide module steel pan forms: exceeding 1” in height.
    b. For all others: exceeding ¼” in height.

3.7 REPAIR OF DEFECTIVE AREAS

A. Remove honeycombed and other defective concrete, exposing sound concrete. Cut and chip edges straight and perpendicular to the surface or slightly undercut to a depth of ½". Featheredges are not permitted.

B. Dampen areas to be patched and surrounding areas. Patch with patching material according to manufacturer's recommendations. Submit data on patching material to engineer for review prior to starting repair.

C. After surface water has evaporated from the area to be patched, apply patching material to the surface.

D Apply curing to the repaired surface as soon as possible and maintain for a minimum of 3 days.

3.8 CURING

A. Maintain concrete in a moist condition for at least 5 days at temperatures above 70°F and at least 7 days at temperatures between 40°F and 70°F.

B. Curing Slabs: Curing compounds or moisture retention covers.

1. Apply curing compounds to the concrete surface, immediately after final finishing of the concrete, in accordance with manufacturer's instructions to comply with ASTM C309.

    a. If it is determined that the curing compound is not compatible with the floor finish after the curing compound has been applied, then the curing compound must be removed by mechanical abrasion.

2. Place moisture retention covers on the concrete surface immediately after final finishing of the concrete. Lap edges 6 inches and seal, creating a moisture barrier that must remain intact for the duration of the curing period.

C. Curing Formed Surfaces:

1. Formed surfaces may be cured by leaving forms in place. During hot, dry weather, keep forms moist by sprinkling.
2. When forms are removed before the end of the curing period, apply curing compound to walls and columns.

3.9 JOINTS

A. Construction Joints:

1. Locate construction joints so as not to impair the strength of the structure.
2. With the exception of slabs on grade, continue reinforcement across construction joints.
3. Thoroughly clean the concrete surface at construction joints and remove laitance before placing adjoining concrete.
4. In slabs on grade with control joints, locate construction joints at control joint locations.

B. Slab on Grade Control Joints:

1. Sawcut Control Joints:

a. Conventional: Sawcut joints as soon as the blade does not dislodge aggregate and when the edges of the cut do not ravel. Complete saw-cutting before shrinkage stresses become sufficient to produce cracking. Sawcut joints in straight lines to avoid unsightly joints.
b. SOFF-CUT System: Saw cut control joints with SOFF-CUT System Model G-2000 or GS-1000, 1/8" wide x 1 3/16" deep joints, within (2) hours after final finish at joint location. Do not disturb final slab finish. Saw cuts shall be made with SOFF-CUT saw as manufactured by SOFF-CUT International, Corona, Calif. Equipment shall be used in accordance with manufacturer's instructions. SOFF-CUT System shall not be used for slabs greater than 6" thick.

2. Hand-Tooled Control Joints: Tool joints with hand groovers in straight lines to avoid unsightly joints.

3.10 HOT WEATHER CONCRETING

A. Follow the provisions of this Article and ACI 305 when the rate of evaporation of surface moisture from the concrete exceeds 0.18 lb/sq ft/hr (Figure 2.1.5, ACI 305).

B. Control concrete setting time with the use of water-reducing & retarding admixtures as required to facilitate placing and finishing operations.

C. Before placing concrete, spray the subgrade, forms and reinforcement with water to keep them cool and to prevent absorption of water from the concrete.

D. Transport, place and finish concrete as quickly as practicable. Plan concrete delivery, placing techniques and consolidation methods to avoid cold joints.

E. Maximum temperature of concrete during placing: 90°F.

F. Apply evaporation retardant to the surface of the fresh concrete after screeding and as needed during finishing.

G. Take additional precautions as necessary to prevent plastic shrinkage cracking.

H. Start curing the concrete immediately after finishing operations have been completed.

3.11 COLD WEATHER CONCRETING

A. Follow the provisions of this Article and ACI 306 when the average daily temperature (average of the highest and lowest temperature during the period from midnight to midnight) is less than 40°F.

B. Control concrete setting time with the use of accelerating admixtures and water-reducing accelerating admixtures as required to facilitate placing and finishing operations.

1. Do not use calcium chloride as an accelerating admixture. Only the specified accelerators (Article 2.01 I) shall be used.

C. Temperature of concrete during placing: 55°F to 75°F.

D. Maintain the temperature at the concrete surface between 55°F and 75°F until the concrete reaches 70 percent of its specified compressive strength by providing heated enclosures or insulated blankets.

1. Construct weathertight enclosures, allowing the heated air to circulate around the outer edges of the concrete.
2. Provide a sufficient number of heaters to assure an even temperature within the enclosure.

    a. Use indirect-fired heaters vented to the exterior where heat is supplied to the top of fresh concrete to prevent dusting due to carbonation.

3. Add moisture to the heated air as required to maintain a minimum relative humidity of 40 percent within the enclosure. Do not allow any concrete surface to become dry during the protection period.
4. Maintain enclosures for 24 hours after heating has been discontinued to allow the concrete to cool gradually.
5. Lap insulating materials and cover the edges and corners of the concrete to provide complete and adequate protection.
6. Wrap columns and walls with insulated blankets.
7. Monitor the temperature of the concrete surface regularly with suitable thermometers throughout the protection period.

E. Provide insulation or temporary backfill to protect all earth supported concrete from damage due to frost heaving.

3.12 PROTECTION

A. Protect finished concrete surfaces from damage by construction equipment, materials or methods and by rain or running water.

B. Do not load any concrete member in such a way as to overstress the concrete.

3.13 FIELD QUALITY CONTROL

A. Testing Laboratory: Conduct testing and write reports as outlined in this Article under provisions of Division 1.

B. Strength Tests:

1. During the progress of the work, take samples of concrete for strength tests in accordance with ASTM C172.
2. Make and cure a minimum of 4 cylinders in accordance with ASTM C31 for each of the following:

    a. Each 50 cubic yards of concrete.
    b. Each 3000 square feet of surface area for slabs and walls.
    c. Each class of concrete placed in a day's work.

3. Test each group of 4 cylinders in accordance with ASTM C39 as follows:

    a. Two field cured cylinders to be tested at 7 days or just before anticipated time of form removal. For post-tensioned concrete, test cylinders prior to stressing of tendons.
    b. Two laboratory cured cylinders to be tested at 28 days.

4. A strength test is the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days.
5. The strength level of an individual class of concrete will be considered satisfactory if each strength test equals or exceeds the specified compressive strength.
6. If the strength level of an individual class of concrete is found to be unsatisfactory (per Paragraph 3.13B5), conduct core testing in accordance with ASTM C42, impactometer testing or load testing on the area of concrete in question as required by the Architect/Engineer. If such additional testing does not produce acceptable results, corrective measures will be required to ensure structural adequacy.
   a. Make appropriate adjustments to the concrete mix designs as required.

C. Slump Tests:

1. Make one slump test in accordance with ASTM C143 with each group of 4 cylinders.
2. When concrete is pumped, make the slump test at the point of discharge.
3. Keep a slump cone available at the site for additional testing as required.

D. Air Content Tests: Make one air content test in accordance with ASTM C173 or ASTM C231 with each group of 4 cylinders for air-entrained concrete mixes at point of discharge.

E. Air-dry Density Tests:

1. For structural lightweight concrete, make one air-dry density test in accordance with ASTM C567 for each group of 4 cylinders.

F. Rejection of Concrete:

1. Any concrete that does not meet the specified requirements for air-entrainment, concrete temperature, or slump shall not be placed until corrective measures have been taken, and the concrete has been re-tested to indicate compliance.
2. The Construction Manager shall authorize one party to be responsible for rejection of concrete.

G. Field Quality Control Test Reports:

1. Include the following information in test reports:

   a. Project identification and portion of structure represented.
   b. Concrete mix class and specified compressive strength requirements.
   c. Weather conditions and air temperature.
   d. Concrete temperature, slump and air content test results.
   e. Dates of placing and testing.
   f. Method of curing (field or laboratory).
   g. Strength test results.
   h. Technician's name, certification number with expiration date.

H. Compliance tests for F-numbers shall be performed for all level slabs.

1. Slab measurements and computation of F-numbers shall conform to ASTM E-1155.
2. Compliance tests shall be performed using the Dipstick Floor Profiler or the Face Floor Profileograph.
3. Compliance tests shall be performed by an independent testing laboratory.
4. Compliance tests shall be completed within 24 hours after the final finishing is complete and prior to the removal of any forms and shoring.

5. If cold weather protection prevents testing, then compliance tests shall be performed immediately after the removal of the protection and prior to the removal of any forms and shoring.

END OF SECTION 033000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Architectural precast concrete units for site-work.

B. Related Sections include the following:

1. Section 055000 "Metal Fabrications" for kickers and other miscellaneous steel shapes.
2. Section 071900 "Water Repellents" for water-repellent finish treatments.

1.3 DEFINITION

A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:

1. Loads: As indicated.
2. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 120 deg F.

1.5 ACTION SUBMITTALS

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

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings: Detail fabrication and installation of architectural precast concrete units. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit. Indicate joints, reveals, and extent and location of each surface finish. Indicate details at building corners.

1. Indicate separate face and backup mixture locations and thicknesses.
2. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
3. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
4. Include plans and elevations showing unit location and sequence of erection for special conditions.
5. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
6. Indicate relationship of architectural precast concrete units to adjacent materials.
7. Comprehensive engineering analysis certified by the qualified professional engineer responsible for its preparation. Show governing panel types, connections, and types of reinforcement,

including special reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.

D. Samples: For each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches (or as required by design pattern).

1. When other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Welding certificates.

C. Material Certificates: For the following items, signed by manufacturers:

1. Cementitious materials.

D. Material Test Reports: For aggregates.

E. Source quality-control test reports.

F. Field quality-control test reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project in same category as this Project before erection of precast concrete and who can produce an Erectors' Post-Audit Declaration.

B. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Participates in PCI's plant certification program and is designated a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units.

C. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

D. Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.

E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

F. Welding: Qualify procedures and personnel according to AWS D1.1/D.1.1M, "Structural Welding Code - Steel"; and AWS D1.4, "Structural Welding Code - Reinforcing Steel."

G. Sample and Range Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of 3 sample panels approximately 16 sq. ft. in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.

1. Locate panels where indicated or, if not indicated, as directed by Architect.
2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
3. After acceptance of repair technique, maintain one sample panel at manufacturer's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.
4. Demolish and remove sample panels when directed, or maintain for record during production and installation process.

H. Mockups: After sample and range panel approval but before production of architectural precast concrete units, construct full-sized mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup as indicated on Drawings including aluminum framing, glass, sealants, cast stone and architectural precast concrete complete with anchors, connections, flashings, and joint fillers.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents unless such deviations are specifically approved by Architect in writing.

I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management And Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground.

B. Support units during shipment on nonstaining shock-absorbing material.

C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

D. Place stored units so identification marks are clearly visible, and units can be inspected.

E. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses which would cause cracking or damage.

F. Lift and support units only at designated points shown on Shop Drawings.

1.9 SEQUENCING

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Fabricators: Subject to compliance with requirements, provide products by one of the following:

1. ATMI LLC
2. CoreSlab Structures

3. High Concrete
4. Gate Precast

2.2 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

B. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

2.3 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized, and chromate wash treated after fabrication and bending.

D. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, epoxy coated.

E. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.

F. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, deformed, flat sheet, Type 1 bendable coating.

G. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, mix gray with white cement, of same type, brand, and mill source.

B. Supplementary Cementitious Materials:

1. NONE allowed.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.

a. Gradation: Uniformly graded.

2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate, unless otherwise approved by Architect.

D. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixtures: ASTM C 494/C 494M, Type A.

2.5 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

C. Zinc-Coated Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M.

1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.
2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

D. Welding Electrodes: Comply with AWS standards.

2.6 BEARING PADS

A. Provide one of the following bearing pads for architectural precast concrete units as recommended by precast fabricator for application:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, Type A durometer hardness of 50 to 70, ASTM D 2240, minimum tensile strength 2250 psi, ASTM D 412.
2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Type A durometer hardness of 70 to 90, ASTM D 2240; capable of supporting a compressive stress of 3000 psi with no cracking, splitting, or delaminating in the internal portions of pad. Test one specimen for every 200 pads used in Project.
3. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.7 ACCESSORIES

A. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install architectural precast concrete units.

2.8 GROUT MATERIALS

A. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.

2.9 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

B. Normal-Weight Concrete Mixtures: Proportion full-depth mixture by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi minimum.

C. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.

D. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

E. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.10 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.

B. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Form joints are not permitted on faces exposed to view in the finished work.
2. Edge and Corner Treatment: Uniformly chamfered.

2.11 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

C. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A 775/A 775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcement to maintain at least 3/4-inch minimum coverage. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.

D. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses.

E. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

F. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.

G. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 117.

H. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

I. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that will not show in finished structure.

J. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

K. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.12 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

B. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with the following product tolerances:

1. Overall Height and Width of Units, Measured at the Face Exposed to View: As follows:

a. 6 feet or under, plus or minus 1/8 inch.

2. Total Thickness or Flange Thickness: Plus 1/8 inch, minus 1/8 inch.
3. Variation from Square or Designated Skew (Difference in Length of the Two Diagonal Measurements): Plus or minus 1/8 inch per 72 inches or 1/4 inch total, whichever is greater.
4. Length and Width of Block-outs and Openings within One Unit: Plus or minus 1/8 inch.
5. Bowing: Plus or minus L/360, maximum 1/4 inch.
6. Local Smoothness: 1/8 inch per 6 feet.
7. Warping: 1/16 inch per 24 inches of distance from nearest adjacent corner.
8. Tipping and Flushness of Plates: Plus or minus 1/8 inch.

C. Position Tolerances: For cast-in items measured from datum line location, as indicated on Shop Drawings.

1. Weld Plates: Plus or minus 1/4 inch.
2. Inserts: Plus or minus 1/8 inch.
3. Handling Devices: Plus or minus 1/2 inch.
4. Reinforcing Steel and Welded Wire Fabric: Plus or minus 1/4 inch where position has structural implications or affects concrete cover; otherwise, plus or minus 1/2 inch.
5. Location of Bearing Surface from End of Member: Plus or minus 1/4 inch.

2.13 FINISHES

A. All exposed Panel faces shall be free of joint marks, grain, and other obvious defects. Corners shall be straight and sharp. Finish **exposed-face surfaces** of architectural precast concrete units to match approved mockups and as follows:

1. Honed Finish: Use continuous mechanical abrasion with fine grit or sand to provide slightly etched but smooth finish.

B. Finish unexposed surfaces of architectural precast concrete units by float finish.

2.14 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

B. Owner will employ an independent testing agency to evaluate architectural precast concrete fabricator's quality-control and testing methods.

1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

C. Strength of precast concrete units will be considered deficient if units fail to comply with ACI 318 requirements for concrete strength.

D. Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M.

1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Architect.
2. Cores will be tested in an air-dry condition.
3. Strength of concrete for each series of 3 cores will be considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
4. Test results will be made in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports will include the following:

    a. Project identification name and number.
    b. Date when tests were performed.
    c. Name of precast concrete fabricator.
    d. Name of concrete testing agency.
    e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Do not install precast concrete units until supporting cast-in-place building structural framing has attained minimum allowable design compressive strength or supporting steel or other structure is complete.

3.2 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.

1. Install temporary or permanent plastic spacing shims or bearing pads as precast concrete units are being erected.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
4. **Unless otherwise indicated, maintain uniform joint widths of 3/8 inch based on design intent**.

C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

D. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
2. Welds not specified shall be continuous fillet welds, using no less than the minimum fillet as specified by AWS.
3. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780.
4. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.
5. Remove, reweld, or repair incomplete and defective welds.

E. Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

3.3 ERECTION TOLERANCES

A. Erect architectural precast concrete units level, plumb, square, and true, without exceeding the following noncumulative erection tolerances:

1. Plan Location from Building Grid Datum: Plus or minus 1/4 inch.
2. Top Elevation from Nominal Top Elevation: As follows:

    a. Exposed Individual Panel: Plus or minus 1/4 inch.
    b. Non-Exposed Individual Panel: Plus or minus 1/4 inch.
    c. Exposed Panel Relative to Adjacent Panel: 1/4 inch.
    d. Non-Exposed Panel Relative to Adjacent Panel: 1/4 inch.

3. Support Elevation from Nominal Support Elevation: As follows:

    a. Maximum Low: 1/4 inch.
    b. Maximum High: 1/4 inch.

4. Plumb in Any 6 Feet of Element length: 1/4 inch.
5. Maximum Jog in Alignment of Matching Edges: 1/8 inch.
6. Joint Width (Governs over Joint Taper): Plus or minus 1/8 inch.
7. Maximum Jog in Alignment of Matching Faces: 1/8 inch.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections and prepare reports:

1. Erection of precast concrete members.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

C. Field welds will be subject to visual inspections and nondestructive testing according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 REPAIRS

A. Repair architectural precast concrete units if permitted by Architect. The Architect reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches **blend with color, texture, and uniformity of adjacent exposed surfaces (especially in regard to sand-blasted finish – patch should be prepared to duplicate the final finish). Final color and finish can show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 10 feet.**

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.6 CLEANING

A. Clean surfaces of precast concrete units exposed to view.

B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034500

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Face brick.
3. Mortar and grout.
4. Reinforcing steel.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.
9. Cavity-wall insulation.

B. Related Sections include the following:

1. Division 7 Section "Sheet Metal Flashing and Trim" for sheet metal flashing.
2. Division 7 Section "Through-Penetration Firestop Systems" for firestopping at openings in masonry walls.
3. Division 7 Section "Joint Sealants" for sealing control and expansion joints in unit masonry.

C. Products furnished, but not installed, under this Section include the following:

1. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 5 Section "Structural Steel."

D. Products installed, but not furnished, under this Section include the following:

1. Steel lintels and shelf angles for unit masonry, furnished under Division 5 Section "Metal Fabrications."
2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."

1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths (f'_m) at 28 days.

B. Determine net-area compressive strength (f'_m) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.5 SUBMITTALS

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

B. Shop Drawings: For the following:
   1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
   2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection: For the following:

   1. Colored mortar.
   2. Weep holes/vents.

D. Samples for Verification: For each type and color of the following:

   1. Face brick, in the form of straps of five or more bricks.
   2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
   3. Weep holes/vents.
   4. Accessories embedded in masonry.

E. Qualification Data: For testing agency.

F. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

   1. Masonry units.

      a. Include material test reports substantiating compliance with requirements.
      b. For bricks, include size-variation data verifying that actual range of sizes falls within specified tolerances.
      c. For exposed brick, include material test report for efflorescence according to ASTM C 67.
      d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

   2. Cementitious materials. Include brand, type, and name of manufacturer.
   3. Grout mixes. Include description of type and proportions of ingredients.
   4. Reinforcing bars.
   5. Joint reinforcement.
   6. Anchors, ties, and metal accessories.

G. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

H. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Contractor. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

1. Clay Masonry Unit Test: For each type of unit required, per ASTM C 67.
2. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.
3. Mortar Test (Property Specification): For each mix required, per ASTM C 780.
4. Grout Test (Compressive Strength): For each mix required, per ASTM C 1019.

E. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Provide up to three (3) mockups for exterior walls at no additional cost to Owner.
2. Build mockups for typical exterior and interior walls in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories.
    a. Include a sealant-filled joint at least 16 inches long in each mockup.
    b. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
3. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
4. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
5. Protect accepted mockups from the elements with weather-resistant membrane.
6. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
    a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.2 CONCRETE MASONRY UNITS (CMUs)

A. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide bullnose units for outside corners, unless corners are furred, concealed or otherwise indicated.

B. Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
2. Weight Classification:

   a. Below Grade: Normal weight.
   b. Above Grade for Interior Exposure: Lightweight.
   c. Above Grade for Exterior Exposure: Normal weight.

3. Size (Width): Manufactured to the following dimensions:

   a. 4 inches nominal; 3-5/8 inches actual.
   b. 6 inches nominal; 5-5/8 inches actual.
   c. 8 inches nominal; 7-5/8 inches actual.
   d. 12 inches nominal; 11-5/8 inches actual.

2.3 CONCRETE AND MASONRY LINTELS

A. General: Provide either concrete or masonry lintels, as indicated, complying with requirements below.

B. Concrete Lintels: Precast units made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by same method used for concrete masonry units.

C. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 BRICK

A. General: Provide shapes indicated and as follows:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Face Brick:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 5500 psi.
2. Grade: SW.

3. Type: FBS.
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
6. Application: Use where brick is exposed, unless otherwise indicated.
7. Face Brick: Norman, Nominal 4 x 3 x 12 (Actual: 3 5/8" wide by 2 2/3" high by 11 5/8" long).
8. Color and Texture: To match campus brick in colors, pattern, and texture – reference brick veneer on Library.
9. Bond Pattern: 1/3rd Running Bond.

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Products:

a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
b. Davis Colors; True Tone Mortar Colors.
c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.

D. Colored Cement Product: Packaged blend made from portland cement and lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color to match existing adjacent construction, as selected from manufacturer's standard colors.
2. Pigments shall not exceed 10 percent of portland cement by weight.
3. Products:

a. Colored Portland Cement-Lime Mix:

1) Glen-Gery Corporation; Color Mortar Blend.
2) Lafarge North America Inc.; Centurion Colorbond PL.
3) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.

E. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

F. Aggregate for Grout: ASTM C 404.

G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products:

a. Euclid Chemical Company (The); Accelguard 80.

b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
c. Sonneborn, Div. of ChemRex; Trimix-NCA.

H. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615 or ASTM A 996, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
4. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
5. Wire Size for Veneer Ties: W1.7 or 0.148-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

D. Masonry Joint Reinforcement for Multi-Wythe Masonry:

1. Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

a. Use where facing and backup wythes are installed simultaneously and where horizontal joints of facing wythe align with those of backup wythe.

2. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate ties that extend into facing wythe. Ties have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

a. Use where backup wythe precedes installation of facing wythe, where indicated, and where horizontal joints of facing wythe do not align with those of backup wythe.
b. Use where facing wythe is of different material than backup wythe.

E. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.188-inch- diameter, hot-dip galvanized, carbon-steel continuous wire.

2.7 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
2. Stainless-Steel Wire: ASTM A 580, Type 304.
3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153.
4. Stainless-Steel Sheet: ASTM A 666, Type 304.
5. Steel Plates, Shapes, and Bars: ASTM A 36.
6. Stainless Steel bars: ASTM A 276 or ASTM a 666, Type 304.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
2. Tie Section for Steel Frame: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.188-inch- diameter, hot-dip galvanized steel wire.

D. Partition Top anchors: 0.097-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

E. Adjustable Masonry-Veneer Anchors

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.

a. Anchor Section: Gasketed sheet metal plate, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom; top and bottom ends bent to form pronged legs of length to match thickness of insulation or sheathing; and raised rib-stiffened strap, 5/8 inch wide by 6 inches long, stamped into center to provide a slot between strap and plate for inserting wire tie. Provide anchor manufacturer's standard, self-adhering, modified bituminous gaskets manufactured to fit behind anchor plate and extend beyond pronged legs.
b. Fabricate sheet metal anchor sections and other sheet metal parts from 0.097-inch- thick, steel sheet, galvanized after fabrication.
c. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.188-inch-diameter, hot-dip galvanized steel wire.
d. Products:

1) Dayton Superior Corporation, Dur-O-Wal Division; D/A 210 with D/A 700-708.
2) Heckmann Building Products Inc.; 315-D with 316.
3) Hohmann & Barnard, Inc.; DW-10-X.

2.8 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of dimensions indicated.

B. Postinstalled Anchors: Provide anchors with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

2.9 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A 240, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.

a. Products:

1) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth).
2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.

3. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
4. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
5. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 3/8 inch to form a stop for retaining sealant backer rod.

B. Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:

1. Copper-Laminated Flashing: 7-oz./sq. ft. copper sheet bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

a. Products:

1) Advanced Building Products Inc.; Copper Fabric Flashing.
2) AFCO Products Inc.; Copper Fabric.
3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
5) Polytite Manufacturing Corp.; Copper Fabric Flashing.
6) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
7) York Manufacturing, Inc.; York Copper Fabric Flashing.

C. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and

designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use the following, unless otherwise indicated:

1. Aluminum Weep Hole/Vent: One-piece, L-shaped units made from sheet aluminum, designed to fit into a head joint and consisting of a vertical channel with louvers stamped in web and with a top flap to keep mortar out of the head joint; painted before installation to comply with Division 9 painting Sections in color approved by Architect to match that of mortar.

a. Product: Hohmann & Barnard, Inc.; #343W - Wilko Weep Hole.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Provide one of the following configurations:

a. Strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings.
b. Strips, not less than 1-1/2 inches thick and 10 inches wide, with dimpled surface designed to catch mortar droppings and prevent weep holes from being clogged with mortar.
c. Sheets or strips full depth of cavity and installed to full height of cavity.
d. Sheets or strips not less than 1 inch thick and installed to full height of cavity with additional strips 4 inches high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from being clogged with mortar.

2. Products:

a. Advanced Building Products Inc.; Mortar Break.
b. Archovations, Inc.; CavClear Masonry Mat.
c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
d. Mortar Net USA, Ltd.; Mortar Net.

F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

1. Products:

a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.11 CAVITY-WALL INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, closed-cell product extruded with an integral skin.

B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.12 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers:

a. Diedrich Technologies, Inc.
b. Hydrochemical Technologies, Inc.
c. ProSoCo, Inc.

2.13 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar to portland cement and lime.
3. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement and lime.
4. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type N.
3. For mortar parge coats, use Type S.
4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
5. For interior non-load-bearing partitions, Type O may be used instead of Type N.

C. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Mix to match Architect's approved Sample.

D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's Sample.

E. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

2.14 SOURCE QUALITY CONTROL

A. Engage a qualified independent testing agency to perform source quality-control testing indicated below:

1. Payment for these services will be made by Contractor.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

B. Clay Masonry Unit Test: For each type of unit furnished, per ASTM C 67.

1. Conform to requirements of Pore Size Distribution Testing as described below and to requirements of Division 1 Section “Quality Requirements.”

a. Pore Size Distribution Testing: A representative sample of ten (10) brick proposed to be manufactured for this Project, sampled in accordance with ASTM C67, shall be submitted to the Architect for testing for pore size distribution. Every unit tested is required to indicate a minimum value (Maage Factor) of F greater than 70, where:

1) F = 3.2/PV + 2.4P3, F = relative frost resistance; PV = volume of pores (cm3) per unit mass (g); and P3 = volume of pores larger than 3 microns expressed as the percentage of PV.
2) A minimum of 5 units shall be tested. Additional units may be tested at the Owner’s discretion.

b. The Maage Factor shall be determined from the pore size distribution of the brick as measured by mercury intrusion porosimetry. The testing shall be done using procedures similar to those in ASTM Standard D 4284-83, “Pore Volume Distribution of Catalysts by Mercury Intrusion Porosimetry.” Pore volumes shall be measured between pore diameters of 100 um and 0.01 um. This corresponds to intrusion pressures of 1.5 psi and 15000 psi. Pressure readings shall be converted to pore diameters using a contact angle of 124 degrees.

c. The brick shall be tested by an independent testing agency selected by the Contractor. An additional suite of ten (10) brick shall be selected by this agency and a minimum of 5 brick tested from the brick which are delivered to the Project site to ensure conformance with the above minimum criteria.

d. The Contractor shall pay for all testing of the brick. This shall include both the ASTM C216 series and the Pore Size Distribution Tests.

C. Concrete Masonry Unit Test: For each type of unit furnished, per ASTM C 140.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Verify that foundations are within tolerances specified.
2. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry, unless indicated otherwise.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

H. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in the following bond patterns; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

1. Concrete Masonry Units: Running bond.
2. Face Brick: Flemish bond as indicated on the drawings.
3. Lay sound absorptive masonry units with open ends of cavities facing downward and slots facing interior of room. Keep slots free of mortar and debris.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

G. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 7 Section "Fire-Resistive Joint Systems."

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

3.5 CAVITY WALLS

A. Bond wythes of cavity walls together using the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 1.77 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.

b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.

2. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

C. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

a. Reinforcement above is in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten anchors to masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.

2. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 1.77 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.9 MOVEMENT JOINTS

A. General: Install movement joint materials in unit masonry as masonry progresses. Do not allow materials to span movement joints without provision to allow for in-plane wall or partition movement.

1. Maximum spacing between masonry movement joints, where location is not shown, shall be 20'-0." The maximum distance from a corner to the nearest movement joint shall be a 4'-0" and the sum of the dimensions from a corner to the movement joints on both sides of the corner shall not exceed 20'-0."
2. Provide movement joints between all interior load-bearing and non-load bearing walls, at all abrupt changes in wall height and at all changes in wall thickness.
3. Verify all final movement joint locations with Architect prior to construction.

B. Form control joints in concrete masonry as follows:

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

C. Form expansion joints in brick made from clay or shale as follows:

1. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants," but not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels as indicated, where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows, unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

2. At multi-wythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
4. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
5. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes/vents in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Space weep holes 16 inches o.c., unless otherwise indicated.

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

F. Install vents in head joints in exterior wythes at 24 inches o.c., unless otherwise indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.12 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

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

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

1. Payment for these services will be made by Contractor.

2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

B. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

C. Clay Masonry Unit Test: For each type of unit provided, per ASTM C 67.

D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

END OF SECTION 042000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Cast stone panels and trim.

B. Related Sections include the following:

1. Division 7 Section “Joint Sealants.”

1.3 SUBMITTALS

A. Product Data: Include dimensions of individual components.

B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

C. Samples: For each color and texture of cast stone required.

D. Qualification Data: For manufacturer.

E. Material Test Reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, with sufficient production capacity to manufacture required units.

1. Manufacturer shall be a producing member of the Cast Stone Institute.

PART 2 - PRODUCTS

2.1 CAST STONE UNITS

A. Regional Materials: Cast stone units shall be manufactured within 500 miles of Project site from aggregates that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Provide cast stone units complying with ASTM C 1364 using the vibrant dry tamp or wet-cast method.

1. Provide units that are resistant to freezing and thawing.
2. Slope exposed horizontal surfaces 1:12, unless otherwise indicated.
3. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
4. Provide drips on projecting elements, unless otherwise indicated.

C. Cure units by one of the following methods:

1. Cure units with steam in enclosed curing room at temperature of 105 deg F or above and 95 to 100 percent relative humidity for 6 hours.
2. Cure units with dense fog and water spray in enclosed warm curing room at 95 to 100 percent relative humidity for 24 hours.
3. Cure units to comply with one of the following:

    a. Not less than 5 days at mean daily temperature of 70 deg F or above.
    b. Not less than 6 days at mean daily temperature of 60 deg F or above.
    c. Not less than 7 days at mean daily temperature of 50 deg F or above.
    d. Not less than 8 days at mean daily temperature of 45 deg F or above.

D. Fabrication Tolerances:

1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.

E. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

F. Color and Texture: Provide units with fine-grained texture and color actual buff limestone.

G. Panel Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast stone material.

1. Epoxy Coating: ASTM A 775/A 775M.
2. Galvanized Coating: ASTM A 767/A 767M.

H. Embedded Anchors and Other Inserts (used for lifting): Fabricated from stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304.

2.2 MORTAR MATERIALS

A. Regional Materials: Aggregate for mortar, cement, and lime shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Masonry Cement: ASTM C 91.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Capital Materials Corporation; Flamingo Color Masonry Cement.
    b. Essroc, Italcementi Group; Brixment.
    c. Lafarge North America Inc.; Lafarge Masonry Cement.
    d. Lehigh Cement Company; Lehigh Masonry Cement.
    e. National Cement Company, Inc.; Coosa Masonry Cement.

F. Mortar Cement: ASTM C 1329.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Lafarge North America Inc.; Lafarge Mortar Cement.

G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Davis Colors; True Tone Mortar Colors.
b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
c. Solomon Colors, Inc.; SGS Mortar Colors.

H. Colored Cement Product: Packaged blend made from portland cement and hydrated lime, masonry cement or mortar cement and mortar pigments, all complying with specified requirements and containing no other ingredients.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Colored Portland Cement-Lime Mix:

1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
2) Lafarge North America Inc.; Eaglebond Portland & Lime.
3) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.

b. Colored Masonry Cement:

1) Capital Materials Corporation; Flamingo Color Masonry Cement.
2) Essroc, Italcementi Group; Brixment-in-Color.
3) Lafarge North America Inc.; U.S. Cement Custom Color Masonry Cement.
4) Lehigh Cement Company; Lehigh Custom Color Masonry Cement.
5) National Cement Company, Inc.; Coosa Masonry Cement.

2. Formulate blend as required to produce color indicated or, custom color as selected by architect.

I. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. White-Mortar Aggregates: Natural white sand or crushed white stone.
3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

J. Water: Potable.

2.3 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.

B. Dowels: 1/2-inch- diameter, round bars, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.

C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.

2.4 MORTAR MIXES

A. Do not use admixtures including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime, masonry cement or mortar cement mortar unless otherwise indicated.

B. Comply with ASTM C 270, Proportion Specification.

1. For setting mortar, use Type N.
2. For pointing mortar, use Type N.

C. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Mix to match Architect's selection.

D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.
2. Application: Use colored aggregate mortar for exposed mortar joints.

PART 3 - EXECUTION

3.1 SETTING CAST STONE IN MORTAR

A. Install cast stone units to comply with requirements in Division 4 Section "Unit Masonry and Stone Veneer Assemblies."

B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
2. For stone panels, shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.
3. Coordinate installation of cast stone with installation of flashing specified in other Sections.

C. Set units in full bed of mortar with full head joints, unless otherwise indicated.

1. Fill dowel holes and anchor slots with mortar.
2. Fill collar joints solid as units are set.
3. Build concealed flashing into mortar joints as units are set.
4. Keep head joints in coping and other units with exposed horizontal surfaces open to receive sealant.
5. Keep joints at shelf angles open to receive sealant.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

E. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated. Keep joints free of mortar and other rigid materials.

F. Prepare joints indicated to receive sealant and apply sealant of type and at locations indicated to comply with applicable requirements in Division 7 Section "Joint Sealants."

3.2 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

B. Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except due to warpage of units.

3.3 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

1. Replace units in a manner that shows no evidence of replacement.

B. Progress Cleaning: Clean cast stone as work progresses.

1. Remove mortar fins and smears before tooling joints.
2. Remove excess sealant immediately, including spills, smears, and spatter.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone.

END OF SECTION 047200

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work under this Section consists of providing all labor, materials and equipment necessary or required for the complete fabrication and erection of all structural steel as detailed on the Structural Drawings and as specified herein. The work includes furnishing and installing the non-shrink grout beneath the structural steel.

B. Related work specified elsewhere:

1. Miscellaneous and Architectural Metal - Section 05500
2. Painting - Section 09800 and 09900
3. Loose lintels are furnished under Section 05500; Miscellaneous Metals.

C. Work furnished but not installed: Anchor bolts and other embedded connection components.

1.2 QUALITY ASSURANCE

A. The latest editions of the following standard specifications shall govern the fabrication and erection of the structural steel, except as modified by the design drawings or this specification:

1. AISC "Specifications for Structural Steel Buildings".
2. AISC: Code of Standard Practice for Steel Buildings and Bridges.
3. AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
4. AWS "Structural Welding Code D1.1".
5. Steel Structures Painting Council Specifications SSPC.
6. AWS "Structural Welding Code - Reinforcing Steel", D1.4.

B. All welders in both shop and field shall be certified under AWS "Standard Qualification Procedure" for the type or types of welding being performed and shall have been continuously engaged in such welding.

C. Fabricator and erector shall have continuous business operation for at least 5 years. Furthermore, by evidence of a minimum of 5 projects similar in complexity to this project, indicate capability of conducting work of a similar nature; have sufficient well maintained equipment to perform the work; maintain an adequate stockpile of materials; and have qualified labor to fabricate or erect without delaying the project.

1.3 SUBMITTALS

A. SHOP DRAWINGS

1. Submit the proposed Shop Drawing Submittal Schedule prior to submitting any of the shop drawings for review.
2. Shop drawings shall be submitted to the Engineer for review. Shop Drawings shall include erection plans and framing elevations, all shop and erection details including copes, connections, threaded fasteners, and welds.
3. Erection plans shall clearly denote locations of all connections which require field welds, slip critical bolts, and any bolts other than ¾” diameter A325, if specified.
4. Provide setting drawings, templates and directions for installation of anchor bolts and other devices.
5. Shop drawings shall include the grade of steel, connection bolt and anchor bolt material types, and the type of welding rods.
6. Submit calculations for connections not detailed on the Structural Drawings and not covered by AISC tables. Specifically, these include:

a. Moment connections.
b. Bracing connections.
c. Skewed shear connections.

7. Resubmitted shop drawings:

a. All information, which is correct on the original submittal, will not be changed in any way on the resubmitted shop drawings.
b. If information on a shop drawing must be changed due to a Change Order, then all the changes must be clouded on the resubmitted shop drawings.

8. Shop drawing action codes:

a. Shop drawings marked "reviewed with exceptions" require the marked corrections to be made. No resubmittal is required. Fabrication may commence leading to steel erection.
b. Shop drawings marked "revise and resubmit" require the marked corrections to be made. The drawings must be resubmitted for review. Fabrication may not commence.
c. Shop drawings marked both "reviewed with exceptions" and "revise and resubmit" require the marked corrections to be made. The drawings must be resubmitted for review. Fabrication may commence. Steel erection may not begin until the subsequent submission has been reviewed and returned for use in steel erection.

10. Shop Drawings will be reviewed by the Architect/Engineer for correct interpretation of the Drawings but this check shall not relieve the Contractor of his primary responsibility to provide structural steel complying with the Construction Documents.

B. CERTIFICATIONS

1. Provide certification for all welders used in field and shop work.
2. Provide certification that shop drawings, including all connections, were prepared under the supervision of a Professional Engineer registered in the state where the project is located.

C. TEST REPORTS

1. Submit all test reports regarding welding, bolting, and headed studs per Section 3.04.
2. Submit current ES Reports, by ICC Evaluation Service, Inc. for all non-standard post installed anchors. See paragraphs 2.01 J and K for standard post installed anchors.

D. PRODUCT INFORMATION

1. Submit product information for materials specified in Article 2.01 under the provisions of Division 1 and demonstrating compliance with specified requirements.

1.4 PRODUCT HANDLING

A. Exercise care in handling, storing and erection of structural steel to avoid damage to pieces, welds, joints and paint. Secure pieces against displacement in transit.

B. Structural steel members, which are stored at the job site, shall be stored above ground on platforms, skids or other supports. Protect with weatherproof cover held in place.

C. Clean members, which have become soiled before erecting.

D. Anchor bolts and other anchorage devices, which are embedded in cast-in-place concrete, shall be delivered to the project site in time to be installed before the start of concrete operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. W-Shapes and Column Base Plates: ASTM A992, Grade 50.

B. Angles, Channels, Plates and Bars: ASTM A36.

C. Rectangular and Square HSS: ASTM A500, Grade B, Fy = 46 ksi.

D. Structural steel pipe: ASTM A53, Type E or S, Grade B, Fy = 35 ksi or ASTM A501, Fy=36 ksi.

E. Round HSS members: ASTM A500, Grade B, Fy=42 ksi.

F. Connection bolts:

1. ASTM A325N (bearing bolts) - unless otherwise noted.
2. ASTM A325SC (Slip Critical) - per Section 3.01B.

G. Anchor rods: ASTM F1554, Grades 36, 55 or 105 as indicated.

H. Welding rods:

1. AWS E70XX for A36 steel.
2. AWS E70XX low hydrogen for Grade 50 steel.

I. Nuts: All nuts shall have a minimum Rockwell hardness of 89HRB or a Brinell hardness of 10HB.

J. Post Installed Expansion Anchors:

1. Expansion anchor shall have an ES Report demonstrating the anchor has met the requirements of AC 193 for mechanical anchors as specified by the International Code Council (ICC).
2. Standard:

    a. Hilti Kwik Bolt T2 by Hilti Fastening Systems.
    b. Power-Stud + SD2 by Powers Fasteners.

3. Information shown on structural drawings:

    a. Diameter
    b. Finish
    c. Material
    d. Minimum embedment in concrete
    e. Ultimate tension capacity for testing purposes

K. Post Installed Adhesive Anchors:

1. Adhesive anchors shall have an ES Report demonstrating the anchor has met the requirements of AC 308 for adhesive anchors as specified by ICC.

2. Standards:

    a. Hilti HIT RE-500-SD by Hilti Fastening Systems.
    b. Powers PE 1000 + Epoxy Adhesive Anchoring System by Powers Fasteners.

3. Information shown on drawings:

    a. Diameter
    b. Finish
    c. Material
    d. Minimum embedment in concrete
    e. Ultimate tension capacity for testing purposes

L. Headed studs (used as anchor studs or as shear connectors): ASTM A108.

1. Standards:

    a. KSM Fastening Systems, Omark Industries
    b. Nelson Stud Welding, TRW Nelson Division
    c. Blue Arc Welding Studs, Erico Products

M. Deformed bar anchors: ASTM A496.

1. Standards:

    a. KSM Fastening Systems, Omark Industries
    b. Nelson Stud Welding, TRW Nelson Division

2. The use of manually welded anchors, rods, bars, straps, or reinforcing bars is not acceptable as a substitute for headed studs or deformed bar anchors.

N. Malleable Iron Wedge Inserts: Peerless Wedge Inserts, Richmond Screw Anchor Company (3/4" long).

O. Non-Shrink Grout:

1. Grout shall be prepackaged requiring only the addition of potable water.
2. Grout shall not contain metallic substances or aluminum powder.
3. Grout shall attain compressive strengths per ASTM C-1107.
4. Grout shall meet the dimensional stability requirements of ASTM C-1107, Grade C, when prepared according to the manufacturer's instructions and tested at 40°F and 90°F.
5. Grout shall be capable of maintaining a flowable consistency for a minimum of 45 minutes at 70°F.
6. Standards:

    a. Five Star Grout; Five Star Products, Inc.
    b. Sonogrout 14k; Sonneborn

P. Shop primer: per Section 05100 - 2.03.

Q. Sliding Bearing Plates:

1. Standards:

a. Fluorogold FC1010-CS by The Fluorocarbon Co.
b. Bal-Slide 10N-CS by Balco

2.2 FABRICATION

A. Fabricate structural steel in accordance with the AISC "Specification for Structural Steel Buildings" with the modifications and additional requirements specified in this Section.

B. Shop connections shall be welded or bolted with A325 bolts.

C. Manual welding shall be accomplished with shielded arc electrodes of E70XX series or the strength equivalent of flux cored arc weld. Submerged arc process welding shall be grade SAW-2. Welding shall be accomplished by welders certified for weld types and positions involved according to the "Structural Welding Code" A.W.S. D1.1.

D. Connections:

1. All connections not detailed on the structural drawings shall be designed by the steel fabricator in accordance with the AISC Manual of Steel Construction consistent with the member design.
2. Unless otherwise noted, beam connections shall be simple connections.
3. The steel supplier shall design the connections for the reactions indicated on the framing plans. Where reactions are not given, the connections shall be designed for 50% of the total allowable uniform load on the span.
4. Connection angles shall be 5/16" in thickness (minimum).
5. Minimum connection strength shall not be less than that of two 3/4" diameter A325 bolts.
6. Beam connections shall consist of double web angles unless detailed otherwise on the drawings or as specified below.
7. Skewed shear connections shall consist of double bent plates unless the angle between the intersecting webs is less than 70°.
8. The design of single plate shear connections shall conform to AISC Manual of Steel Construction, 13th Edition.

E. Welds shall be tested as outlined in Article 3.04. The correction of faulty welds shall be in accordance with AWS "Structural Welding Code D1.1".

F. Welding of all reinforcing steel shall comply with the provisions of AWS D1.4.

2.3 SHOP PRIMER

A. Shop prime all structural steel except the following:

1. Contact surfaces in connections using high strength slip critical bolts.
2. Surfaces to be field welded.
3. Structural steel that will receive sprayed-on fireproofing.
4. Steel encased in concrete.
5. Embedded steel items (surfaces in contact with concrete).

B. Shop Primer:

1. Modified alkyd, lead-free, chromate-free, rust-inhibitive primer.
2. Volume solids: 55.0 ± 2 per cent minimum
3. Shop primer shall be compatible with the specified finish paint.
4. Standard:

a. Series 88HS Azeron Primer; Tnemec Company, Inc.
b. Interlac 260 HS; International Protective Coating (or an approved equal).

C. Surface Preparation:

1. SSPC - SP6 Commercial Blast Cleaning (for structural steel exposed to weather).
2. SSPC - SP3 Power Tool Cleaning (for steel not exposed to weather).

D. Application:

1. Structural steel shall receive one coat of shop primer except surfaces inaccessible after assembly shall receive a second coat.
2. Dry film thickness: 2.0 mils minimum.
3. Follow coating manufacturer's printed directions.

2.4 SHOP GALVANIZING

A. Shop hot-dip galvanize structural steel listed below in accordance with ASTM A123:

1. All structural steel embedded in concrete.
2. Any steel indicated galvanized on the drawings.
3. All relieving angles supporting exterior walls.
4. All lintels within exterior walls.

B. Surface Preparation: SSPC – SP6 Commercial Blast Cleaning.

PART 3 - EXECUTION

3.1 ERECTION

A. Erect in accordance with the AISC "Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design".

B. Field connections shall be made using A325 high strength bolts, bearing type, except where welded connections or where slip critical type bolts are indicated on the Structural Drawings.

1. Where slip critical bolts are indicated on the Structural Drawings, the faying surfaces shall be left unpainted.

C. Bolt Tightening:

1. All bolts shall be tensioned in accordance with Table 8.1 of the "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
2. High strength bolts may be tightened by any method found acceptable by the "Specification for Structural Joints Using ASTM A325 or A490 Bolts", section 8.2.

D. Field welds shall be accomplished by welders certified for the weld types and positions involved according to the "Structural Welding Code", A.W.S. D1.1. Use only shielded arc electrodes; E70xx, structural type.

1. Low hydrogen electrodes shall be stored in strict accordance with the provisions of AWS D1.1.

E. Welding procedure for galvanized steel:

1. Remove galvanizing from area to be welded.
2. Protect units from damage by use of non-combustible shields as required.
3. Weld
4. Remove weld slag.
5. Touch-up area with galvanized compound such as ZRC.

F. Post Installed Anchor Installation:

1. All anchors shall be installed in accordance with all the manufacturer's requirements including:

    a. Diameter of hole and method of drilling hole.
    b. Condition of hole including moisture, dust and side roughness.
    c. Temperature during installation.

2. Manufacturer's representative shall meet with Contractor's anchor installer prior to installation. Manufacturer's representative shall review procedures for anchor installation. Contractor's anchor installer shall install three (3) anchors in presence of the manufacturer's representative. Install anchors shall be "pull-tested" to 50 percent of anchor's ultimate tension capacity. Installer shall not install anchors on project until he has successfully installed three (3) anchors that have met the "pull-test" requirements in the opinion of the manufacturer's representative.

G. Set all structural steel accurately to lines and grades. Connect temporarily with sufficient high strength bolts to insure complete safety of the structural until permanent connections are made. Erection tolerances shall be in accordance with the AISC Code of Standard Practice.

H. Provide temporary guidelines, bracing, and shoring as required, to maintain stability and alignment until the entire system (including metal deck erection) is erected, permanently connected, braced and set.

I. Any and all misfits shall be reported to the Engineer for resolution. Burning of new or unfair holes or cutting with a torch will not be permitted without the approval of the Engineer. Reamers, twist drills and saws shall be employed where burning is prohibited.

J. Any member that has assumed a bend or buckle in its final position due to forced fit shall have one or both ends and any intermediate connections unbolted and re-drilled or reamed to relieve such bowing to the satisfaction of the Engineer.

K. No piece that has been bent, broken, twisted or otherwise damaged shall be incorporated into the work. Such pieces shall be repaired or corrected on the ground to the satisfaction of the Engineer or replaced with a new piece. Failure to observe this will be cause for rejection of the piece in place.

L. Prior to the erection of any steel, the Contractor shall verify the location, elevation and plumbness of all anchor bolts and concrete surfaces. The Contractor shall report immediately to the Engineer in writing any condition which he finds unacceptable or that would prevent erection of the structural steel within AISC tolerance for plumbness and elevation. The Contractor shall be responsible for all corrections, and all corrections shall be made in a manner acceptable to the Engineer.

M. The erector shall acquaint himself with all conditions at the site, which can affect his methods and sequence of operations. Abide by Owner's regulations concerning traffic, parking and construction material delivery.

N. Remove primer or any coating from the area to be welded prior to field welding.

O. FIELD TOUCH-UP BY STEEL ERECTOR: Field bolts, field welds and abrasions to the shop coat shall be repaired and painted by the structural steel erector using the same paint and care as for shop coat. All such

surfaces shall be washed with a suitable degreasing solvent. This contractor shall also remove any and all accumulations of mud, clay, rust, scale, grease, etc. that have been acquired, for any reason, during shipment, storage and erection and the shop coat restored to its original condition.

P. Sub base (leveling) plates under column base plates will not be permitted.

Q. Install headed studs using manufacturer-approved equipment in accordance with the manufacturer's instructions.

R. Furnish all anchor bolts for anchorage of structural steel at an advance date for incorporation into the concrete foundation by others. Provide heavy hex nuts and washers for each bolt. Anchor bolts shall not be installed until shop drawings have been reviewed.

S. When installing expansion anchors (Article 2.1 J) or adhesive anchors (Article 2.1K), locate the reinforcement within the concrete to avoid damaging the reinforcement during the anchor installation process. Post-installed anchors shall be located as shown on the drawings. Any changes of anchor location shall be approved by the Engineer.

T. Observe all federal, state and local laws and area trade rules in the erection and handling of structural steel.

3.2 BASEPLATE GROUTING

A. Concrete surfaces and baseplates shall be clean and free from rust, grease, oil, and other debris.

B. Place a watertight form around the area to be grouted. Formwork should be designed to insure free flow of the grout under the baseplate and preventing the creation of air pockets. The height of the formwork should be sufficient to allow for complete gravity fill under the plate.

C. Saturate the area to be grouted with water until uniformly damp. Remove excess water just before placing the grout.

D. In order to avoid air pockets and ensure complete filling of the cavity between the baseplate and concrete, the grout shall be placed from one side only. Placement shall be completed without interruption.

E. Dry packing or damp packing is not allowed.

F. See manufacturer's printed instructions for additional information regarding preparation, mixing, placing and curing of the grout.

3.3 CLEANING UP

A. Upon completion of erection, promptly remove all tools, equipment and rubbish caused by or resulting from the erection work.

3.4 TESTING

A. All testing shall be by a testing agency approved by the Architect-Engineer, performed by registered/qualified technicians.

B. Prior to testing bolts and welds in the field, all field assembled connections shall be visually inspected. The inspector shall review the Engineer-approved shop drawings prior to inspection. The inspector shall verify that bolts, field welds, field added plates and stiffeners agree with the Engineer-approved field connection detail on the shop drawings. This inspection shall include verifying weld lengths, faying bolt surfaces have

been brought into contact, and connected member alignment is true. The inspector shall be given any Engineer-approved field changes made to the connections to include in the review.

C. Test shop and field welds as indicated below:

1. All complete penetration welds shall be tested for 100% of the total weld length using ultrasonic testing apparatus.
2. All partial penetration welds shall be tested for 50% of the total weld length using the magnetic particle method.
3. 20% of all field fillet welds shall be tested using the magnetic particle method.
4. All welds shall be visually inspected.

D. Inspect and test bolted connections.

1. For connections where slip critical bolts are indicated on the Structural Drawings, testing and inspection methods shall conform to the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for slip critical bolts. The testing shall include the inspector observing the "pre-installation testing" of each combination of grade, diameter, length and production lot of bolts and nuts to be used on the project. The "pre-installation testing" shall include bolt crews installing three sample bolts, of each combination, in a device that directly reads tension in the bolt. (e.g. Skidmore - Wilhelm Machine) Bolt crews shall demonstrate to the inspector the ability to install bolts to the tensions given in table 8.1 of "Specification for Structural Joints Using ASTM A325 and A490 Bolts". The inspector shall observe bolt installation practices in the field to verify procedures used during the "pre-installation testing" are being properly applied.
   Any disputes that arise concerning the tension in the bolts shall be resolved with methods set forth in section 10 of "Specification for Structural Joints Using ASTM A325 and A490 Bolts": Arbitration.
2. For all other connections, visual inspection to ensure that the plies of the connected elements have been brought into snug contact is required.

E. Test Post-Installed Anchors:

1. The Testing Agency shall randomly select 5 anchors for every 100 installed. Selected anchors shall reflect all types of installations including:

   a. Overhead horizontal surfaces
   b. Vertical surfaces
   c. Sloped or skewed surfaces

2. Pull-test each selected anchor to 50% of the anchor’s ultimate tension capacity as given by the engineer for the installation.
3. Engineer and Anchor Manufacturer shall be notified immediately if an anchor does not pass test requirements. Contractor shall not proceed with corrective measures without written instructions from the Engineer describing remedial action to be taken.

F. Test reports shall be prepared by the testing agency giving the following:

1. The type and location of test conducted.
2. The test results.
3. Interpretation of the test results stating whether they comply with the Specification requirements.
4. Procedure taken if the test results are not acceptable.
5. Test results of re-tests after corrective measures have been completed. The cost of all re-testing shall be borne by the Contractor.

END OF SECTION 051200

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cold-formed metal framing for:

1. Non-Load-Bearing Exterior walls.
2. Cold-formed metal framing assemblies and supports other than walls specifically detailed on the Structural Drawings.
3. Bridging, bracing, clips and other accessories associated with the cold-formed metal framing assemblies within the scope of this Section.

1.2 RELATED SECTIONS

A. Division 05 Section “Metal Fabrications” for masonry shelf angles and connections.

B. Division 09 Section “Non-Structural Metal Framing” for interior non-load-bearing metal-stud framing and ceiling-suspension assemblies.

C. Division 09 Section “Gypsum Board” for interior and exterior gypsum board and tile backing panels.

D. Division 09 Section “Gypsum Board Shaft-Wall Assemblies” for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 REFERENCES

A. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

B. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

C. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runner Tracks, and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.

E. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.

F. AISI – Code of Standard Practice.

G. AISI – Standard for Cold-Formed Steel Framing General Provisions.

H. AISI - North American Specification (NASPEC) for the Design of Cold-Formed Steel Structural Members - 2001.

I. American Welding Society (AWS).

1. AWS D1.1 "Structural Welding Code - Steel."
2. AWS D1.3 "Structural Welding Code - Sheet Steel."

1.4 PERFORMANCE REQUIREMENTS – Exterior Non-Load-Bearing Walls

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under the following conditions:

1. Design Loads:

    a. Dead Loads: Weights of materials and construction.
    b. Wind Loads: Wind pressures for member, connection, and anchorage design shall be determined in accordance with the ASCE 7-05 "Minimum Design Loads for Buildings and Other Structures", the 2006 International Building Code (IBC2006), and any local jurisdiction building code procedures for Components and Cladding. Figures 6-11 through 6-17 of the ASCE 7-05 shall be used, based on applicability, to determine the External Pressure Coefficient, GC_p. The criteria given in the General Notes of the Structural Drawings shall be used for the calculation of design wind pressures.
    c. Seismic Loads: For Seismic Design Category C and higher (seismic design is not required in SDC A and B), seismic loads for member, connection, and anchorage design shall be determined in accordance with the ASCE 7-05 "Minimum Design Loads for Buildings and Other Structures", the 2006 International Building Code (IBC2006), and any local jurisdiction building code procedures for Architectural Components. The criteria given in the General Notes of the Structural Drawings shall be used for the calculation of design seismic loads.

2. Deflection Limits: Design framing systems to withstand Design Loads without deflections greater than the following:

    a. Out-of-plane horizontal deflection of 1/360 of the wall height for walls supporting non-masonry veneer. For walls supporting masonry veneer, out-of-plane horizontal deflection shall not exceed 1/600 of the wall height.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg. F.
4. Design framing to maintain clearance at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

    a. Upward and downward movement of 3/4 inch.

5. Exterior walls acting as back-up framing for masonry walls shall be constructed from stud members of 43 mil minimum thickness.

B. Design Cold-Formed Steel Framing in accordance with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and the following standards:

1. Comply with AISI's "Standard for Cold-Formed Steel Framing – General Provisions".
2. Comply with AISI's "Standard for Cold-Formed Steel Framing – Wall Stud Design".
3. Comply with AISI's "Standard for Cold-Formed Steel Framing – Header Design".

C. Design exterior non-load-bearing wall framing to accommodate horizontal deflections without regard for contribution of sheathing materials.

1.5 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submit manufacturer's product literature and data sheets for specified products.

C. Manufacturer's certification of product compliance with codes and standards.

D. Shop Drawings: Submit shop drawings showing:

1. Locations of framing members, wall framing sections and opening elevations.
2. Sizes and spacing of framing members.
3. Methods of fastening framing members to each other.

4. Locations and spacing of lateral bracing and structural bracing systems.
5. Accessory products required for complete installation.
6. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Welder certificates for record only.

F. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips.
7. Miscellaneous structural clips and accessories.

G. Research/Evaluation Reports: For cold-formed metal framing.

1.6 QUALITY ASSURANCE

A. Engineering Responsibility – Exterior Non-Load-Bearing Walls: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified and licensed 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 cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1, “Structural Welding Code – Steel”, and AWS D2.3, “Structural Welding Code – Sheet Steel”.

F. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

G. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

H. AISI Specifications and Standards: Comply with AISI’s “North American Specification for the Design of Cold-Formed Steel Structural Members” and the following standards.

1. Comply with AISI’s “Standard for Cold-Formed Steel Framing – General Provisions”.
2. Comply with AISI’s “Standard for Cold-Formed Steel Framing – Wall Stud Design”.
3. Comply with AISI’s “Standard for Cold-Formed Steel Framing – Header Design”.

I. Provide effective, full time quality control over all fabrication and comply with the pertinent codes and regulations of government agencies having jurisdiction.

J. Conduct a pre-installation conference at the Project site to comply with requirements in Division 01 Section “Project Management and Coordination”.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling. Notify cold-formed framing manufacturer and fabricator/wall panelizer of damaged materials received prior to installing.

B. Store materials protected from exposure to rain, snow or other harmful weather conditions, at temperature and humidity conditions per the recommendations of ASTM C955.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Stud Manufacturers:

1. All products to be manufactured by current members of the Steel Stud Manufacturers Association (SSMA).

B. Panelizers / Installers:

1. All panelizing fabricators and pre-panelized wall installers shall have a minimum of six years of experience with the type and process of construction.

2.2 COMPONENTS

A. Structural Studs: Cold-Formed galvanized steel C-studs.

1. Flange Length & Web Depth as required by the construction documents.
2. Minimum Material Thickness as required by the construction documents.
3. Members of 97mil, 68mil, and 54mil thickness shall be formed from ASTM A653, Grade D (minimum yield 50 ksi) steel.
4. Members of 33mil and 43mil thickness shall be formed from ASTM A653, Grade A (minimum yield 33 ksi) steel.

B. Structural Track: Cold-Formed galvanized, unpunched, steel runner tracks

1. Flange Length: 1 1/4 inch (32 mm) T125 flange.
2. Web: Track Web Size to match stud web size.
3. Minimum Material Thickness: Track Thickness shall be 54mil (14 Gage) in thickness unless noted otherwise.
4. Structural track sections shall be formed from ASTM A653, Grade D (minimum yield 50 ksi) steel.

C. CRC / Cold Rolled Channel Bridging:

1. Size: 250U50-54
2. Material: ASTM A6533, Grade D (minimum yield 50 ksi) steel.

D. Vertical Deflection Clips: Manufacturer’s standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web. Mechanical attachment to structure and screw attachment to stud web using step-bushings to permit frictionless vertical movement; 68 mils minimum thickness, size as required by structural

design calculations. Use only vertical deflection connection products that have a valid ICC ES Report complying with ICC Acceptance Criteria AC261.

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement and lateral drift of primary structure, having a valid ICC ES Report complying with ICC Acceptance Criteeria AC261. Mechanical attachment to structure and screw attachment to stud web using step-bushings to permit frictionless vertical movement; 68 mils minimum thickness, size as required by structural design calculations.

F. Self-Drilling Fasteners: Cadmium plated, No.12-14 x ¾ inch, self-drilling, self-tapping fasteners with pilot point; complying with ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

G. Touch-Up Paint: Complying with ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

2.3 MATERIALS

A. Steel: Galvanized Steel meeting or exceeding the requirements of ASTM A653.

1. Coating: Galvanized G60 coating minimum, complying with ASTM C 955.

B. Stud Punch Outs: Three Total Punch Outs - One at center of stud height and one 24" above and below the center. Punch outs shall be 2.5" wide for 600 depth studs.

PART 3 EXECUTION

3.1 INSPECTION

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

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare attachment surfaces so that they are plumb, level, and in proper alignment for accepting the load-bearing and exterior steel stud wall framing.

3.3 FABRICATION – GENERAL

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing, do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correction welding work.
b. Field welding of cold-formed framing elements shall not be permitted for any elements of thickness less than 68 mils.
c. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabricate assemblies level, plumb, and true to line to a maximum allowable out-of-sqaure tolerance variation of 1/8 inch in 10 feet (1:960), and in compliance with the tolerances specified in Part 3.7.

3.4 INSTALLATION – GENERAL

A. Cold-formed framing, other than wall panels, may be shop of field fabricated for installation, or it may be field assembled.

B. Install cold-formed framing according to AISI's "Standard for Cold-Formed Steel Framing – General Provisions" and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing, do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correction welding work.
    b. Field welding of cold-formed framing elements shall not be permitted for any elements of thickness less than 68 mils.
    c. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 07 Section "Thermal Insulation", in built-up exterior framing assemblies, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of work.

3.5 INSTALLATION – NON-LOAD-BEARING WALLS

A. Install continuous tracks sized to match studs. Align tracks accurately and securely achor to supporting structure as indicated.

B. Fasten both flanges of studs to bottom track, unless otherwise indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Mechanically fasten vertical deflection clips to bypassing infill studs and anchor to building structure.

E. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 54 inches apart. Fasten at each stud intersection.

1. Bridging: combination of flat, taut, steel straps of width and thickness indicated and stud-track solid blocking of widths and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

2. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.6 INSTALLATION - NON-BEARING INFILL FRAMING

A. Runners shall be securely anchored to the supporting structure as shown on the drawings.

B. Jack studs or cripples shall be installed below window sills, above window and door heads, and elsewhere to furnish supports.

C. Lateral bracing shall be provided by use of gypsum board and gypsum sheathing or by horizontal straps or cold-rolled channels. Bracing shall conform to Section D3 of the AISI North American Specification (NAS).

3.7 TOLERANCES:

A. Vertical Alignment (Plumbness) of Studs: within $1/960^{th}$ (1/8 inch in 10 feet) of the height.

B. Horizontal Alignment (Levelness) of walls: within $1/960^{th}$ (1/8 inch in 10 feet) of their respective lengths.

C. Spacing of studs: Not more than + 1/8 inch from designed spacing, providing that the cumulative error does not exceed the requirements of the finishing material.

3.8 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspection agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspection

C. Testing agency will report test results promptly and in writing to Contractor and Architect/Engineer.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coating on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A780 and manufacturer’s written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Competion.

END OF SECTION 054100

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Steel framing and supports for countertops.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Steel framing and supports for operable partitions, overhead doors, and coiling doors.
5. Shelf Angles.
6. Metal ships' ladders and railing.
7. Aluminum roof access ladders.
8. Aluminum floor plate and supports.
9. Metal Bollards.

B. Products furnished, but not installed, under this Section:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
2. Division 5 Section "Structural Steel Framing."
3. Division 9 Section "Painting" For field painting of metal fabrications.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Paint products.
2. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.
3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. 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 metal fabrications that are similar to those indicated for this Project in material, design, and extent.

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

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."
3. AWS D1.6, "Structural Welding Code--Stainless Steel."

1.6 PROJECT CONDITIONS

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

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. 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.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 METALS, GENERAL

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

2.3 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316.

C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316.

D. Steel Tubing: ASTM A 500, cold-formed steel tubing.

E. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

2.4 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.5 FASTENERS (may include one or more of the following)

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, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

D. Anchor Bolts: ASTM F 1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

E. Eyebolts: ASTM A 489.

F. Machine Screws: ASME B18.6.3.

G. Lag Bolts: ASME B18.2.1.

H. Wood Screws: Flat head, ASME B18.6.1.

I. Plain Washers: Round, ASME B18.22.1.

J. Lock Washers: Helical, spring type, ASME B18.21.1.

K. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153.

L. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Division 9 painting Sections.

C. Universal Shop Primer (Interior Applications): Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

1. Use primer with a VOC content meeting requirements of current applicable Standards.
2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Zinc-Rich Primer (Exterior Applications): Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

1. Use primer with a VOC content meeting requirements of current applicable Standards.
2. Products:

a. Carboline Company; Carbozinc 621.
b. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
c. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
d. Tnemec Company, Inc.; Tneme-Zinc 90-97.

E. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

H. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.7 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 true to line and level 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 and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be 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.

1. 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.

2.8 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports that are not part of structural steel framework, not specified in other Sections, where indicated and 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 retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts if units are installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where indicated.

E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.9 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.10 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

D. Prime shelf angles located in exterior walls with zinc-rich primer.

2.11 METAL LADDERS

A. General:

1. Comply with ANSI A14.3 unless otherwise indicated.

B. Aluminum Ladders:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ACL Industries, Inc.
b. Alco-Lite Industrial Products.
c. O'Keeffe's Inc.
d. Precision Ladders, LLC.

e. Thompson Fabricating, LLC.

2. Space siderails 18 inches apart unless otherwise indicated.
3. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
4. Rungs: Extruded-aluminum tubes, not less than 3/4 inch deep and not less than 1/8 inch thick, with ribbed tread surfaces.
5. Fit rungs in centerline of siderails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.
6. Provide platforms as indicated fabricated from pressure-locked aluminum bar grating or extruded-aluminum plank grating, supported by extruded-aluminum framing. Limit openings in gratings to no more than 3/4 inch in least dimension.
7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted aluminum brackets.
8. Provide minimum 72-inch- high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.

2.12 METAL SHIPS' LADDER

A. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.

1. Fabricate ships' ladders, including railings from steel.
2. Fabricate treads and platforms from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 3/4 inch in least dimension.
3. Fabricate treads from rolled-steel floor plate.

B. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

1. Rails and Posts: 1-5/8-inch- diameter top rails and 1-5/8-inch- diameter posts.
2. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

a. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes okay.

C. Prime steel ships' ladders, including treads, railings, brackets, and fasteners, with primer specified in this section.

2.13 METAL FLOOR PLATE AND GRATINGS

A. Fabricate from rolled-steel floor plate of thickness indicated below:

1. Thickness: 1/4 inch.

B. Provide grating sections where indicated, fabricated from welded or pressure-locked steel bar grating, and for aluminum construction, fabricate from extruded-aluminum plank grating. Limit openings in gratings to no more than 3/4 inch in least dimension.

C. Provide steel and/or aluminum angle supports as indicated.

D. Include steel and/or aluminum angle stiffeners, and fixed and removable sections as indicated.

2.14 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.

B. Fabricate bollards with 3/4-inch- diameter steel bars set near base of bollard, crisscrossed as detailed, tack-welded into place.

2.15 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.16 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish (where indicated): AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. Class I, Clear Anodic Finish (where indicated): AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 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 bolts, 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.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 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 operable partitions securely to and rigidly brace from building structure.

3.3 INSTALLING METAL BOLLARDS

A. Fill bollards solidly with concrete, mounding top surface to shed water. Install as detailed in documents.

3.4 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.

END OF SECTION 055000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Exterior aluminum pipe and tube railings.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Handrails and Railings:

1. Comply with ASTM E 985, based on testing per ASTM E 894 and ASTM E 935.
2. Capable of withstanding structural loads required by ASCE 7 without exceeding allowable design working stresses of materials involved.
3. Capable of withstanding the following structural loads without exceeding the allowable design working stress of materials involved:

a. Top Rail of Guards: Concentrated load of 200 lbf applied at any point and in any direction, and a uniform load of 50 lbf/ft. applied horizontally and concurrently with uniform load of 100 lbf/ft. applied vertically downward. Concentrated and uniform loads need not be assumed to act concurrently.
b. Handrails Not Serving as Top Rails: Concentrated load of 200 lbf applied at any point and in any direction, and a uniform load of 50 lbf/ft. applied in any direction. Concentrated and uniform loads need not be assumed to act concurrently.
c. Infill Area of Guards (if applicable): Horizontal concentrated load of 200 lbf applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area. Load on infill area need not be assumed to act concurrently with loads on top rails.

1.4 SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, details of installation, attachments to other Work.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Test Reports: Indicating handrails and railings comply with ASTM E 985.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Aluminum Pipe and Tube Railings:

a. Alumaguard.
b. Aluminum Tube Railings, Inc.

c. Blum, Julius & Co., Inc.
d. Braun, J. G. Co.
e. Hollaender Manufacturing Co.
f. Superior Aluminum Products, Inc.
g. Thompson Fabricating Company.
h. Wagner, R & B, Inc.

2.2 METALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for use and finish indicated, and with not less than the strength and durability of the alloy and temper designated below:

1. Extruded Bar and Tube: ASTM B 221, alloy 6063-T5/T52.
2. Extruded Structural Pipe and Tube: ASTM B 429, alloy 6063-T6.
3. Drawn Seamless Tube: ASTM B 210, alloy 6063-T832.
4. Plate and Sheet: ASTM B 209, alloy 6061-T6.
5. Die and Hand Forgings: ASTM B 247, alloy 6061-T6.
6. Castings: ASTM B 26/B 26M, alloy A356-T6.

2.3 MISCELLANEOUS MATERIALS

A. Welding Electrodes and Filler Metal: Provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners: Same basic metal as fastened metal; concealed, unless otherwise indicated or unavoidable, and standard with systems indicated.

C. Anchors: Fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined per ASTM E 488.

D. Grout and Anchoring Cement: Premixed, nonshrink, nonmetallic grout complying with ASTM C 1107 or erosion-resistant, nonshrink, anchoring cement; recommended by manufacturer for use indicated.

2.4 FABRICATION

A. General: Fabricate to design, dimensions, and details indicated, but not less than that required to support structural loads.

1. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

B. Form changes in direction of railing members bending, mitering, or inserting prefabricated flush-elbow fittings.

C. Form curves by bending in jigs to produce uniform curvature without buckling, twisting, cracking, or otherwise deforming exposed surfaces.

D. Welded Connections: Connect handrail and railing members by welding. Cope and weld or use welded-in fittings. Weld connections continuously.

E. Welded Connections for Aluminum Pipe: Connect handrail and railing members with concealed internal welds, using manufacturer's standard system of sleeve and socket fittings.

F. Brackets, Flanges, Fittings, and Anchors: Fabricate wall brackets, flanges, miscellaneous fittings, and anchors to connect handrails and railings to other work.

1. Cast or form metal of same material and finish as rails.
2. For galvanized handrails and railings, fabricate galvanized brackets, flanges, fittings, and anchors.

G. Close exposed ends of handrail and railing members with prefabricated end fittings.

H. Provide wall returns at ends of wall-mounted handrails.

2.5 FINISHES

A. Mechanical Finish: AA-M12 (Mechanical Finish: nonspecular as fabricated).

B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Perform cutting, drilling, and fitting required to install handrails and railings. Set units accurately in location, alignment, and elevation.

1. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
2. Set posts plumb within a tolerance of 1/16-inch in 3 feet.
3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4-inch in 12 feet.

B. Anchor posts in concrete by inserting into formed or core-drilled holes and grouting annular space.

END OF SECTION 055213

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Closures and trim – Chimney Caps.
2. Sun-Shade Canopies.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design exterior decorative formed metal items, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Decorative formed metal items, including anchors and connections, shall withstand the effects of gravity loads and the following loads and stresses without exceeding the allowable design working stress of materials involved and without exhibiting permanent deformation in any components:

1. Wind Loads on Exterior Items: 20 lbf/sq. ft..

C. Seismic Performance: Exterior decorative formed metal items, including anchors and connections, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor is 1.0.

D. 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.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include finishing materials.

B. Shop Drawings: Show fabrication and installation details for decorative formed metal.

1. Include plans, elevations, component details, and attachments to other work.
2. Indicate materials and profiles of each decorative formed metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

D. Samples for Verification: For each type of exposed finish required, prepared on 6-inch- square Samples of metal of same thickness and material indicated for the Work.

E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Coordination Drawings: For decorative formed metal elements that house items specified in other Sections. Show dimensions of housed items, including locations of housing penetrations and attachments, and necessary clearances.

G. Qualification Data: For qualified Installer, fabricator, and professional engineer.

H. Welding certificates.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing decorative formed metal similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Installer Qualifications: Fabricator of products.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

D. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver decorative formed metal products wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

B. Store products on elevated platforms in a dry location.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with decorative formed metal by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate installation of anchorages for decorative formed metal items. 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.

B. Coordinate installation of decorative formed metal with adjacent construction to ensure that wall assemblies, flashings, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes.

PART 2 - PRODUCTS

2.1 SHEET METAL

A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.

B. Aluminum Sheet: Flat sheet complying with ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H32.

2.2 MISCELLANEOUS MATERIALS

A. Gaskets: As required to seal joints in decorative formed metal and remain weathertight; as recommended in writing by decorative formed metal manufacturer.

1. ASTM D 1056, Type 1, Class A, grade as recommended by gasket manufacturer to obtain seal for application indicated.
2. Closed-cell polyurethane foam, adhesive on two sides, release paper protected.

B. Sealants, Exterior: ASTM C 920; elastomeric silicone sealant; of type, grade, class, and use classifications required to seal joints in decorative formed metal and remain weathertight; and as recommended in writing by decorative formed metal manufacturer.

C. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as necessary for strength, corrosion resistance, and compatibility in fabricated items.

1. Use filler metals that will match the color of metal being joined and will not cause discoloration.

D. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.

1. Provide concealed fasteners for interconnecting decorative formed metal items and for attaching them to other work unless otherwise indicated.

E. Structural Anchors: For applications indicated to comply with certain design loads, provide chemical torque-controlled expansion anchors with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

F. Nonstructural Anchors: For applications not indicated to comply with design loads, provide metal expansion sleeve anchors or metal-impact expansion anchors of type, size, and material necessary for type of load and installation indicated, as recommended by manufacturer, unless otherwise indicated.

G. Anchor Materials:

1. Material for Exterior Locations: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

H. Sound-Deadening Materials:

1. Insulation: Unfaced, mineral-fiber blanket insulation complying with ASTM C 665, Type I, and passing ASTM E 136 test.
2. Mastic: Cold-applied asphalt emulsion complying with ASTM D 1187.

I. Backing Materials: Provided or recommended by decorative formed metal manufacturer.

J. Isolation Coating: Manufacturer's standard epoxy coating.

1. Coating shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 PAINTS AND COATINGS

A. Universal Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble decorative formed metal items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Coordinate dimensions and attachment methods of decorative formed metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.

C. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch- wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch and support with concealed stiffeners.

D. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.

1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.

E. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce decorative formed metal items as needed to attach and support other construction.

F. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install decorative formed metal items.

G. Where welding or brazing is indicated, weld or braze joints and seams continuously. Grind, fill, and dress to produce smooth, flush, exposed surfaces in which joints are not visible after finishing is completed.

1. Use welding and brazing procedures that will blend with and not cause discoloration of metal being joined.

2.5 CLOSURES AND TRIM

A. Form closures and trim from metal of type and thickness indicated below. Fabricate to fit tightly to adjoining construction, with weathertight joints at exterior installations.

1. Aluminum Sheet: Minimum 0.063 inch or thickness required to comply with performance requirements Finish: High-performance organic coating.
2. Closures and trim may be fabricated from prefinished metal sheet in lieu of finishing after fabrication provided unfinished edges are concealed from view and not exposed to weather.

B. Conceal fasteners where possible; otherwise, locate where they are as inconspicuous as possible. Size fasteners to support closures and trim, with fasteners spaced to prevent buckling or waviness in finished surfaces.

C. Drill and tap holes needed for securing closures and trim to other surfaces.

D. Incorporate gaskets where indicated or needed for concealed, continuous seal at abutting surfaces.

E. Miter or cope trim members at corners and reinforce with bent metal splice plates to form tight joints.

2.6 EXTERIOR SUNSHADE

A. Provide custom manufactured sunshade structure by of the following fabricators:

1. Construction Specialties.
2. Doralco
3. LinEl Signature
4. Architectural Grills and Sunshades Inc.
5. MAB & Associates

B. MATERIAL

1. Blades and fascia shall be fabricated from a minimum .125 (1/8”) wall thickness extruded aluminum. Blades, louvers, and framing shall be of design as indicated on drawings.
2. Mounting brackets shall be fabricated from a minimum .375 (3/8”) wall thickness.
3. Aluminum Extrusions: ASTM B221, Alloy 6063-T6
4. **Fully mechanically fastened construction (or fully welded provided installation to support system in field allows for fully constructed units brought to site for installation).**

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.

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

D. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.

E. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturers' written instructions.

1. Color: Custom color as selected by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative formed metal.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate and place decorative formed metal items level and plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install decorative formed metal.

1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where needed to protect metal surfaces and to make a weathertight connection.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

D. Install concealed gaskets, joint fillers, insulation, sealants, and flashings, as the Work progresses, to make exterior decorative formed metal items weatherproof.

E. Install concealed gaskets, joint fillers, sealants, and insulation, as the Work progresses, to make interior decorative formed metal items soundproof or lightproof as applicable to type of fabrication indicated.

F. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.

3.3 ADJUSTING AND CLEANING

A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

C. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.4 PROTECTION

A. Protect finishes of decorative formed metal items from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION 057500

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Wood blocking, cants, and nailers.
4. Wood furring and grounds.
5. Plywood backing panels.

B. Related Sections include the following:

1. Division 6 Section “Interior Architectural Woodwork” for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NHLA: National Hardwood Lumber Association.
3. NLGA: National Lumber Grades Authority.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 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.
3. For fire-retardant treatments specified to be High-Temperature (HT) type 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.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.
6. Metal framing anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS

2.1 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. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

B. Wood Products: Comply with the following:

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

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 cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawl spaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).

1. Use treatment that does not promote corrosion of metal fasteners.
2. Use Exterior type for exterior locations and where indicated.
3. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
4. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not b through, contain colorants, or otherwise adversely affect finishes.

D. Application: Treat items indicated on Drawings, and the following:

1. Concealed blocking.
2. Roof construction.
3. Plywood backing panels.

2.4 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.
4. Cants.
5. Furring.
6. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 15 percent maximum moisture content and any of the following species:

1. Mixed southern pine; SPIB.

C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.

D. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. 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.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Data, Communication, and Electrical Equipment Backing Panels: 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.

2.6 FASTENERS

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

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1.

G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

D. Do not splice structural members between supports, unless otherwise indicated.

E. 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.

F. 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 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

G. Sort and select lumber so that natural characteristics will 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.

H. Comply with AWPA 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.

I. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

J. Use common wire 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; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or 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.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 PROTECTION

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

END OF SECTION 061053

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Exterior Wall and Roof sheathing.
2. Sheathing joint-and-penetration treatment.

B. Related Sections include the following:

1. Division 6 Section "Miscellaneous Rough Carpentry" for plywood backing panels.
2. Division 7 Section “Modified Bituminous Sheet Air Barrier” for weather resistant barrier

1.3 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 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 specified to be High-Temperature (HT) type, 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 a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Preservative-treated plywood.
2. Fire-retardant-treated plywood.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

1.5 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

2.1 WOOD PANEL PRODUCTS, GENERAL

A. Plywood: DOC PS 1.

B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

C. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA C9.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat all plywood, unless otherwise indicated and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Comply with performance requirements in AWPA C27.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Use Exterior type for exterior locations and where indicated.
3. Use Interior Type A, High Temperature (HT) for roof sheathing and where indicated.
4. Use Interior Type A, unless otherwise indicated.

B. 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.

C. Identify fire-retardant-treated plywood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

D. Application: Fire-Retardant Treat all plywood that is used below roof deck and interior walls, unless otherwise indicated.

2.4 WALL SHEATHING

A. Plywood Exterior Wall Sheathing: Exposure 1, Structural I sheathing.

1. Span Rating: Not less than 32/16.
2. Nominal Thickness: Not less than 11/32 inch.

B. Plywood: DOC PS 1; AWPA C27, Interior Type A, fire-retardant treated, low-hygroscopic-type formulation. Use fire-retardant-treatment formulations that do not b through or otherwise adversely affect finishes. Kiln-dry material after treatment.

1. Span Ratining: Not less than 16/0.
2. Thickness: 1/2 inch.
3. Location: Typically behind masonry or metal rain-screen.

C. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177.

1. Product: Subject to compliance with requirements, provide one of the following:

a. "Dens-Glass Gold" by G-P Gypsum Corporation.
b. “e(2)XP” by National Gypsum Company.
c. CertainTeed GlasRoc®“ Sheathing

2. Type and Thickness: Type X, 5/8 inch thick.
3. Size: 48 by 108 inches for vertical installation.

2.5 ROOF SHEATHING

A. Plywood Roof Sheathing: Exterior, Structural I sheathing.

1. Span Rating: Not less than 24/0.
2. Nominal Thickness: Not less than 3/4 inch.

2.6 FASTENERS

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

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

2.7 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing Board: 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.

B. Sheathing Tape for Glass-Mat Gypsum Sheathing Board: 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 board and with a history of successful in-service use.

C. Coordinate joint treatment with air/vapor barrier.

2.8 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 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.

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. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Use common wire 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. Install fasteners without splitting wood.

E. Coordinate wall 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.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. 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.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30S for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall Sheathing:

a. Screw to cold-formed metal framing.
b. Space panels 1/8 inch apart at edges and ends.

3.3 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 boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. Install boards 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 boards but do not cut into facing.

C. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board 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 boards.

3.4 SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient quantity 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 board joints, and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.
3. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

3.5 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.

B. Cover sheathing with water-resistive barrier as follows:

1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.

C. Building Wrap: Comply with manufacturer's written instructions.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.

END OF SECTION 061600

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Flush wood paneling.
2. Wood cabinets.
3. Plastic-laminate cabinets.
4. Plastic-laminate countertops.
5. Solid-surfacing-material countertops.
6. Closet and utility shelving.
7. Window stools.

B. Related Sections include the following:

1. Division 6 Section "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 DEFINITIONS

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

B. Rough carriages for stairs are a part of interior architectural woodwork. Platform framing, headers, partition framing, and other rough framing associated with stairwork are specified in Division 6 Section "Rough Carpentry."

1.4 SUBMITTALS

A. Product Data: For panel products high-pressure decorative laminate, adhesive for bonding plastic laminate, solid-surfacing material, cabinet hardware, and accessories handrail brackets and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for plumbing fixtures faucets soap dispensers and other items installed in architectural woodwork.
4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

C. Samples for Initial Selection:

1. Shop-applied transparent finishes.
2. Shop-applied opaque finishes.

3. Plastic laminates.
4. Solid-surfacing materials.

D. Samples for Verification:

1. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
2. Veneer-faced panel products with or for transparent finish, 24 by 24 inches, for each species and cut. Include at least one face-veneer seam and finish as specified.
3. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish and specified edge material applied to 1 edge.
4. Solid-surfacing materials, 6 inches square.
5. Corner pieces as follows:

    a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
    b. Miter joints for standing trim.

6. Exposed cabinet hardware and accessories, one unit for each type and finish.

E. Product Certificates: For each type of product, signed by product manufacturer.

F. Woodwork Quality Standard Compliance: **Provide quality equal to or better than AWI Compliance standards.**

G. Qualification Data: For both Installer and fabricator, **AWI Certified or equivalent**.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program, **or equivalent**.

B. Installer Qualifications: Fabricator of products and certified participant in AWI's Quality Certification Program, **or equivalent**.

C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

E. Forest Certification: Provide interior architectural woodwork produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."

F. Mock-ups: Build mock-ups to verify selections made under sample submittals and to demonstrate effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed work if undisturbed at time of Substantial Completion.

2. Provide 24” x 24” Panel indicating wood veneer, stain, cut, and matching specified as well as seam at veneer, and examples of each joint and reveal indicated in the drawings.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

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

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 8 Section "Door Hardware" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 MILLWORKERS

A. For all manufacturing and installation of the items contained within this Specification Section, please utilize one of the following Millworkers:

1. Antreasian Design, Inc.
2. Indianapolis Woodworking, Inc.
3. Richeson Cabinets.
4. Or approved as an equal by the architect.

2.2 MATERIALS

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Species and Cut for Transparent Finish: As indicated on drawings.

C. Wood Species for Opaque Finish: **Maple.**

D. Wood Products: Comply with the following:

1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
4. Softwood Plywood: DOC PS 1, Medium Density Overlay.
5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

1. Manufacturer: Subject to compliance with requirements and with architects prior to approval, provide high-pressure decorative laminates by one of the following, with the basis of design as indicated on the documents:

a. Formica Corporation.
b. Lamin-Art, Inc.
c. Nevamar Company, LLC; Decorative Products Div.
d. Pionite Decorative Surfaces; Panolam Industries International Incorporated Div.
e. Wilsonart International; Div. of Premark International, Inc.

F. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.

1. Manufacturers: Provide as indicated on the drawings, No Substitutions/
2. Type: Standard type, unless Special Purpose type is indicated.
3. Colors and Patterns: As indicated on drawings.

G. Tempered Float Glass for Cabinet Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3; with exposed edges seamed before tempering, 6 mm thick.

1. General: 1/4 inch thick with pencil polished edge.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated or required by code, use materials complying with requirements in this Article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified.

1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.

3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use the following treatment type:

1. Exterior Type: Organic-resin-based formulation thermally set in wood by kiln drying.
2. Interior Type A: Low-hygroscopic formulation.
3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking plant certified by testing and inspecting agency.
4. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
5. Kiln-dry materials before and after treatment to levels required for untreated materials.

C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.

1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.
3. Product: Subject to compliance with requirements, provide "Duraflake FR" by Weyerhaeuser.

D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

1. Product: Subject to compliance with requirements, provide "Medite FR" by SierraPine Ltd.; Medite Div.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware."

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing within 10 degrees of cabinet face, with vertical adjustment.

C. Cabinet Pull (typical): Hafele 3” wide edge pull, silver anodized, Model #124.02.920.

D. Catches: Push-in magnetic catches, BHMA A156.9, B03131 Roller catches, or BHMA A156.9, B03071 or Ball friction catches, BHMA A156.9, B03013. Provide as indicated on drawings

E. Shelf Rests: Knape & Vogt, #332 Series flat top shelf support pin.

F. Drawer Slides: BHMA A156.9, B05091.

1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted;full-overtravel-extension type; zinc-plated steel ball-bearing slides.
2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
3. File Drawer Slides: Grade 1HD-200; for drawers not more than 6 inches high and 24 inches wide.
4. Trash Bin Glides: Grade 1HD-100; for trash bins not more than 20 inches high and 16 inches wide.

G. Door Locks: BHMA A156.11, E07121.

H. Drawer Locks: BHMA A156.11, E07041.

I. Grommets for Cable Passage through Countertops: 2-1/2-inch OD, Satin Chrome finish and matching caps with slot for wire passage.

1. Product: Subject to compliance with requirements, provide "MM4A Grommet & MM4A Cover" by Doug Mockett & Company, Inc.

J. Trash Can for Cabinets with attached Toe Kick: Rubbermaid Brute Round container, Model #FG262000, without Lid, #2620, 19 1/2 inches diameter by 22 7/8 high, 20 gallon, gray with Rubbermaid Brute Dolly #2640 (18 1/4 inch diameter by 6 5/8 inches high), model #FG264000.

K. Trash Can for Cabinets with Drawer Glidesk: Rubbermaid 11 Gallon round waste receptacle, 15 3/4 inches by 15 3/4 inches by 18 3/4 inches high, gray, Model #498591GY.

L. 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.

M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

D. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

E. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Contact Adhesive: 250 g/L.

F. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

2.6 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

D. Fabricate woodwork to dimensions, profiles, and details indicated.

E. Complete fabrication, including assembly, finishing, 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 woodwork 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 indicated on Shop Drawings before disassembling for shipment.

F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

G. Install glass to comply with applicable requirements in Division 8 Section "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.7 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

A. Grade: Custom.

B. Wood Species and Cut: As indicated on Drawings.

C. For trim items wider than available lumber, use veneered construction. Do not glue for width.

D. For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.

E. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

F. Assemble casings in plant except where limitations of access to place of installation require field assembly.

G. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

H. Use minimum amount of finishing nails only when absolutely necessary. Nail head no larger than standard ‘Brad’ nail. Fill nail holes to match wood.

2.8 INTERIOR FRAMES AND JAMBS FOR TRANSPARENT FINISH

A. Grade: Custom.

B. Wood Species and Cut: As indicated on Drawings.

C. For frames or jambs wider than available lumber, use veneered construction. Do not glue for width.

D. Fire-Rated Interior Frames and Jambs: Products fabricated from fire-retardant particleboard or fire-retardant medium-density fiberboard with veneered, exposed surfaces and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Fire Rating: 20 minutes.

E. Use minimum amount of finishing nails only when absolutely necessary. Nail head no larger than standard 'Brad' nail. Fill nail holes to match wood.

2.9 FLUSH WOOD PANELING

A. Grade: Premium.

B. Wood Species and Cut: As indicated on Drawings.

1. Lumber Trim and Edges (ONLY where indicated on drawings): At fabricator's option, trim and edges indicated as solid wood (except moldings) may be either lumber or veneered construction compatible with grain and color of veneered panels.

C. Matching of Adjacent Veneer Leaves: As indicated on Drawings.

D. Veneer Matching within Panel Face: As indicated on Drawings.

E. Panel-Matching Method: As indicated on Drawings.

F. Vertical Panel-Matching Method: As indicated on Drawings.

2.10 WOOD CABINETS FOR TRANSPARENT FINISH

A. Grade: Premium.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Reveal Dimension: As indicated.

D. Wood Species and Cut for Exposed Surfaces: As indicated on Drawings.

1. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
2. Matching of Veneer Leaves: Book match.
3. Vertical Matching of Veneer Leaves: End match.
4. Veneer Matching within Panel Face: Balance match.
5. Veneer Matching within Room: Provide cabinet veneers in each room or other space from a single flitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.
6. Comply with veneer and other matching requirements indicated for blueprint-matched paneling.

E. Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
2. Drawer Sides and Backs: Solid-hardwood lumber, with white melamine unless noted otherwise.
3. Drawer Bottoms: Hardwood plywood, with white melamine unless noted otherwise.

F. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.11 PLASTIC-LAMINATE CABINETS

A. Grade: Custom.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Reveal Dimension: As indicated.

D. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: Grade HGS.
2. Vertical Surfaces: Grade VGS.
3. Edges: Grade HGS.

E. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.

a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.

2. Drawer Sides and Backs: White melamine unless noted otherwise.
3. Drawer Bottoms: White melamine unless noted otherwise.

F. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

G. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated on Drawings.

H. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.12 WOOD COUNTERTOPS

A. Grade: Premium.

B. Type of Top: Solid wood for transparent finish, edge glued, with crown direction reversed in adjacent boards, to produce widths indicated. Select boards for similarity of color and grain and arrange boards for optimum match between adjacent boards. Species and cut as follows:

1. Wood Species and Cut: White maple, plain sawn.

C. Type of Top: Panel product for transparent finish (wood veneer laminated over core) as follows:

1. Wood Species and Cut: White maple, plain sawn.
2. Matching of Adjacent Veneer Leaves: As indicated on the Drawings.
3. Matching of Adjacent Veneer Leaves: End match.
4. Veneer Matching within Panel Face: As indicated on the Drawings.
5. Edge Treatment: Solid wood matching face for species and cut.
6. Core Material: Particleboard or medium-density fiberboard.

2.13 PLASTIC-LAMINATE COUNTERTOPS

A. Grade: Custom.

B. High-Pressure Decorative Laminate Grade: HGS.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated on the Drawings.

D. Grain Direction: Parallel to cabinet fronts.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material: Particleboard or medium-density fiberboard.

G. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.

2.14 SOLID-SURFACING-MATERIAL COUNTERTOPS

A. Grade: Custom.

B. Solid-Surfacing-Material Thickness: As indicated.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:

1. As indicated on the Drawings.

D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

1. Fabricate tops with shop-applied edges of materials and configuration indicated.
2. Fabricate tops with loose back-splashes and side-splashes for field application.

E. Install integral sink bowls in countertops in shop.

F. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

2.15 CLOSET AND UTILITY SHELVING

A. Grade: Custom.

B. Shelf Material: 3/4-inch solid lumber.

C. Cleats: 3/4-inch solid lumber.

D. Wood Species: Maple.

E. Tube Rod: Knape & Vogt Model #660 Round tube, stainless steel with #632 stainless steel tubing flange.

2.16 WINDOW STOOLS

A. Grade: Custom.

B. Wood Species and Cut: Maple.

C. Solid Surface: Type and thickness as indicated on drawings.

2.17 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished.

B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

C. General: Drawings indicate items that are required to be shop finished. Finish such items at fabrication shop as specified in this Section. Refer to Division 9 painting Sections for finishing architectural woodwork not indicated to be shop finished.

D. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent-finished items specified to be field finished. Refer to Division 9 painting Sections for material and application requirements.

E. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.

F. Transparent Finish:

1. Grade: Premium.
2. AWI Finish System: Catalyzed lacquer or Catalyzed polyurethane.

G. Opaque Finish:

1. Grade: Custom.
2. AWI Finish System: Two-component polyester.
3. Color: Match Architect's sample .
4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

G. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.

1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

H. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening, unless covered by trim.

1. Install flush paneling with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.

I. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.

3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.

J. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
3. Secure backsplashes to walls with adhesive.
4. Caulk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

K. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

L. Refer to Division 9 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Sheet waterproofing for foundation walls.

1.3 PERFORMANCE REQUIREMENTS

A. Provide waterproofing that prevents the passage of water.

1.4 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1. Include Setting Drawings showing layout, sizes, sections, profiles, and joint details of concrete pavers with paver support assemblies.

C. Samples: For the following products:

1. 12-by-12-inch square of waterproofing and flashing sheet.
2. 4-by-4-inch square of drainage panel.

D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

E. Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of waterproofing for compliance with requirements, based on comprehensive testing of current waterproofing formulations.

F. Sample Warranty: Copy of special waterproofing manufacturer's and Installer's warranty stating obligations, remedies, limitations, and exclusions before starting waterproofing.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who is authorized, approved, or licensed by waterproofing manufacturer to install manufacturer's products.

B. Source Limitations: Obtain waterproofing materials, protection course, and molded-sheet drainage panels through one source from a single manufacturer.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing

period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

A. Special Manufacturer's Warranty: Written warranty, signed by waterproofing manufacturer agreeing to replace waterproofing material that does not comply with requirements or that does not remain watertight during specified warranty period.

1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.
2. Warranty Period: Five years after date of Substantial Completion.

B. Special Installer's Warranty: Written waterproofing Installer's warranty, signed by Installer, covering Work of this Section, for warranty period of two years.

1. Warranty includes removing and reinstalling protection board and drainage panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the following products:

1. Rubberized-Asphalt Sheet Waterproofing:

a. Carlisle Corporation, Carlisle Coatings & Waterproofing Div.; CCW 701.
b. W. R. Grace & Co.; Bituthene 4000.
c. W. R. Meadows, Inc.; Mel-Rol.
d. T. C. Miradri; Miradri.

e. Monsey Bakor; Elasto-Seal 2000.

2.2 SHEET WATERPROOFING

A. Rubberized-Asphalt Sheet: 60-mil- thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil- thick, polyethylene film with release liner on adhesive side and formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Physical Properties: As follows, measured per standard test methods referenced:

a. Tensile Strength: 250 psi minimum; ASTM D 412, Die C, modified.
b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
f. Hydrostatic-Head Resistance: 150 feet minimum; ASTM D 5385.
g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
h. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of sheet waterproofing material.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.

D. Sheet Strips: Self-adhering, rubberized-asphalt composite sheet strips of same material and thickness as sheet waterproofing.

E. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.

F. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.

G. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

1. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.
2. Detail Strips: 62.5-mil- thick, felt-reinforced self-adhesive strip, 9 inches wide, with release film on adhesive side.

H. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.

I. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Thickness: 1/4 inch, nominal.
2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

F. Bridge and cover isolation joints, expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:

a. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 SHEET APPLICATION

A. Install self-adhering sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, rubberized-asphalt sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

D. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths to provide a minimum of 2 thicknesses of sheet membrane over areas to receive waterproofing.

E. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.

F. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic or sealant.

G. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheets extending 6 inches beyond repaired areas in all directions.

I. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.

3.4 PROTECTION COURSE INSTALLATION

A. Install protection course with butted joints over waterproofing membrane before starting subsequent construction operations.

3.5 PROTECTION AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed insulation drainage panels from damage due to ultraviolet light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071326

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes crystalline waterproofing for positive-side application to cast stone and precast concrete.

B. Related Sections:

1. Section 079200 "Joint Sealants" for elastomeric and preformed sealants in concrete and concrete unit masonry walls and floors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include material descriptions and installation instructions for crystalline waterproofing.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Applicator.

B. Product Certificates: For waterproofing, patching, and plugging materials, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for crystalline waterproofing.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: A firm experienced in applying crystalline waterproofing similar in material, design, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and that employs workers trained and approved by manufacturer.

B. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit crystalline waterproofing to be performed according to manufacturer's written instructions.

B. Proceed only after substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.

C. Ambient Conditions: Proceed with waterproofing work only if temperature is maintained at 40 deg F or above during work and cure period, and space is well ventilated and kept free of water.

PART 2 - PRODUCTS

2.1 WATERPROOFING MATERIALS

A. Crystalline Waterproofing: Prepackaged, gray-colored proprietary blend of portland cement, specially treated sand, and active chemicals that, when mixed with water and applied, penetrates into concrete and concrete unit masonry and reacts chemically with the byproducts of cement hydration in the presence of water to develop crystalline growth within substrate capillaries to produce an impervious, dense, waterproof substrate; that has VOC content complying with limits of authorities having jurisdiction; with properties meeting or exceeding the criteria specified below.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. American PERMAQUIK Inc.; Super 200.
    b. AQUAFIN, Inc.; AQUAFIN-1C.
    c. International Chem-Crete, Inc.; Chem-Cretex Cem 600.
    d. Xypex Chemical Corporation; Xypex.

2. Water Permeability: Maximum zero for water at 30 feet when tested according to CE CRD-C 48.
3. Compressive Strength: Minimum 4000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.2 ACCESSORY MATERIALS

A. Patching Compound: Factory-premixed cementitious repair mortar, crack filler, or sealant recommended by waterproofing manufacturer for filling and patching tie holes, honeycombs, reveals, and other imperfections; compatible with substrate and other materials indicated; and VOC content complying with limits of authorities having jurisdiction.

B. Plugging Compound: Factory-premixed cementitious compound with hydrophobic properties and recommended by waterproofing manufacturer; resistant to water and moisture but vapor permeable for all standard applications (vertical, overhead, and horizontal surfaces not exposed to vehicular traffic); compatible with substrate and other materials indicated; and VOC content complying with limits of authorities having jurisdiction.

C. Portland Cement: ASTM C 150, Type I.

D. Sand: ASTM C 144.

E. Water: Potable.

2.3 MIXES

A. Crystalline Waterproofing: Add prepackaged dry ingredients to water according to manufacturer's written instructions. Mix together with mechanical mixer or by hand to required consistency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for suitable conditions where waterproofing is to be applied.

B. Proceed with application only after unsatisfactory conditions have been corrected.

C. Notify Architect in writing of active leaks or defects that would affect system performance.

3.2 PREPARATION

A. Protect other work from damage caused by cleaning, preparation, and application of waterproofing. Provide temporary enclosure to confine spraying operation and to ensure adequate ambient temperatures and ventilation conditions for application.

B. Do not allow waterproofing, patching, and plugging materials to enter reveals or annular spaces intended for resilient sealants or gaskets, such as joint spaces between pipes and pipe sleeves.

C. Stop active water leaks with plugging compound according to waterproofing manufacturer's written instructions.

D. Repair damaged or unsatisfactory substrate with patching compound according to manufacturer's written instructions.

1. At holes and cracks in substrate, remove loosened chips and cut reveal with sides perpendicular to surface, not tapered, and approximately 1 inch deep. Fill reveal with patching compound flush with surface.

E. Surface Preparation: Comply with waterproofing manufacturer's written instructions to remove efflorescence, chalk, dust, dirt, mortar spatter, grease, oils, paint, curing compounds, and form-release agents to ensure that waterproofing bonds to surfaces.

1. Clean concrete surfaces according to ASTM D 4258.

a. Scratch- and Float-Finished Concrete: Etch with 10 percent muriatic (hydrochloric) acid solution according to ASTM D 4260.
b. Prepare smooth-formed and trowel-finished concrete by mechanical abrading or abrasive-blast cleaning according to ASTM D 4259.

2. Concrete Joints: Clean reveals according to waterproofing manufacturer's written instructions.

3.3 APPLICATION

A. General: Comply with waterproofing manufacturer's written instructions for application and curing.

1. Saturate surface with water for several hours prior to application and maintain damp condition until applying waterproofing. Remove standing water.
2. Apply waterproofing to surfaces indicated on Drawings.
3. Number of Coats: Number required for specified water permeability.
4. Application Method: Brush. Apply to ensure that each coat fills voids and is in full contact with substrate or previous coat.
5. Dampen surface between coats.

B. Final Coat Finish: Smooth.

C. Curing: Moist-cure waterproofing for three days immediately after final coat has set, followed by air drying, unless otherwise recommended in writing by manufacturer.

END OF SECTION 071616

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Perimeter, below-grade, wall insulation.
2. Wall insulation.
3. Concealed building insulation.
4. Deck Flute Insulation.
5. Sound attenuation insulation.

B. Related Sections include the following:

1. Division 7 Section "Fluid-Applied Membrane Air Barriers" for related work.
2. Division 7 Sections "Thermoplastic Membrane Roofing" and "Metal Roof Panels" for insulation specified as part of roofing construction.
3. Division 9 Section "Non-Structural Metal Framing" for installation of sound attenuating insulation in metal-framed assemblies.
4. Division 22 Section “Plumbing Insulation.”
5. Division 23 Section “HVAC Insulation.”

1.3 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.4 SUBMITTALS

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

B. Samples for Verification: Full-size units for each type of exposed insulation indicated.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

D. Research/Evaluation Reports: For foam-plastic insulation.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.

3. Combustion Characteristics: ASTM E 136.

1.6 DELIVERY, STORAGE, AND HANDLING

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

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PERIMETER BELOW-GRADE WALL INSULATION

A. Extruded-Polystyrene Board Insulation: Rigid, cellular, polystyrene thermal insulation with closed cells and integral high density skin formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578, Type IV; with an aged thermal resistance (R-value) for 1-inch thickness of 5.0 deg F x h x sq. ft./Btu at 75 deg F at 5 years.

1. Manufacturers:

a. DiversiFoam Products.
b. Dow Chemical Company.
c. Owens Corning.
d. Pactiv Building Product Div.; Pactiv Corp.

2. Type IV, 1.60 lb/cu. ft., unless otherwise indicated.
3. Compressive strength: 25 psi.
4. Thickness: 2”, unless indicated otherwise.

2.3 CONCEALED BUILDING INSULATION

A. Unfaced glass-fiber or slag-wool-fiber/rock-wool-fiber blanket insulation.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

1. Manufacturers:

a. CertainTeed Corporation.
b. Guardian Fiberglass, Inc.
c. Johns Manville International, Inc.
d. Knauf Fiber Glass.
e. Owens Corning.

C. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

1. Manufacturers:

a. Fibrex Insulations Inc.
b. Owens Corning.
c. Thermafiber.

2.4 SOUND ATTENUATION INSULATION

A. Fiberglass or Mineral Fiber Sound Attenuation Acoustical Batt Insulation: 0.7 lb/cu. ft. density, unfaced batts or rolls, non-combustible per ASTM E136, flame spread and smoke developed index not to exceed 25 per ASTM 84. Provide one of the following:

1. Thickness: 4” or as indicated.
2. Products:

a. Sound Attenuation Batt Insulation; Owens Corning.
b. Noise Reducer Batts; CertainTeed Corporation.
c. Thermal Shield; Johns Manville International, Inc.
d. Quiet Therm; Knauf Fiber Glass.

2.5 AUXILIARY INSULATING MATERIALS

A. Insulation Anchors and Washers: Type suitable for substrate into which insulation shall be anchored, with oversized washers to prevent insulation crushing as recommended by insulation manufacturer.

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings

C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls or above insulated ceilings, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER BELOW-GRADE WALL INSULATION

A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

C. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection course with joints butted. Set in adhesive according to insulation manufacturer's written instructions.

D. Protect top surface of horizontal insulation from damage during concrete work by applying protection course with joints butted.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

A. Install mineral- or glass-fiber insulation in building exterior miscellaneous voids and cavities such as at door and window frames, voids formed by structural framing members, and where indicated on drawings according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed. If more than one length is required to fill cavity, 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.
4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

B. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive

insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

C. Stuff mineral or glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.6 INSTALLATION OF SOUND ATTENUATION INSULATION

A. Install sound attenuation insulation in interior partitions where indicated by installing full width batts between studs for full height of partition. Ensure full friction fit holding insulation in place. Install insulation continuous behind electrical boxes and other wall penetrations.

B. Install sound attenuation insulation over suspended ceilings at partitions where indicated in a width that extends insulation 48 inches on either side of partition.

3.7 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 072100

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes self-adhering, vapor-retarding, modified bituminous sheet air barriers.

B. Related Requirements:

1. Section 061600 "Sheathing" for wall and roof sheathings and wall sheathing joint-and-penetration treatments.
2. Section 074213.23 “Metal Composite Material Wall Panels” for metal panel attachments.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

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

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with air barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.3 SELF-ADHERING SHEET AIR BARRIER

A. Modified Bituminous Sheet: 40-mil- thick, self-adhering sheet consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick, cross-laminated polyethylene film with release liner on adhesive side.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Carlisle Coatings & Waterproofing Inc.; CCW-705.
b. Grace, W. R. & Co. - Conn.; Perm-A-Barrier Wall Membrane.
c. Henry Company; Blueskin SA.
d. Meadows, W. R., Inc.; SealTight Air-Shield.
e. Tremco Incorporated, an RPM company; ExoAir 110/110LT.

2. Physical and Performance Properties:

   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   b. Tensile Strength: Minimum 250 psi; ASTM D 412, Die C.
   c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.
   d. Puncture Resistance: Minimum 40 lbf; ASTM E 154.
   e. Water Absorption: Maximum 0.15 percent weight gain after 48-hour immersion at 70 deg F; ASTM D 570.
   f. Vapor Permeance: Maximum 0.05 perm; ASTM E 96/E 96M, Water Method.

2.4 ACCESSORY MATERIALS

A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier membrane.

B. Primer: Liquid waterborne or solvent-borne primer recommended for substrate by air-barrier material manufacturer.

C. Counterflashing Strip (where applicable): Modified bituminous 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil- thick, cross-laminated polyethylene film with release liner backing.

D. Butyl Strip (where applicable): Vapor retarding, 30 to 40 mils thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive, with release liner backing.

E. Modified Bituminous Strip (where applicable): Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick, cross-laminated polyethylene film with release liner backing.

F. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

G. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

H. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

I. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.

J. Sprayed Polyurethane Foam Sealant (filling gaps at penetrations): One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft. density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

K. Modified Bituminous Transition Strip (at windows and framed openings): Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

L. Preformed Silicone-Sealant Extrusion (at window and framed openings): Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

   1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 123 Silicone Seal.
b. Momentive Performance Materials Inc.; US11000 UltraSpan.
c. Pecora Corporation; Sil-Span.
d. Tremco Incorporated, an RPM company; Spectrem Simple Seal.

M. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install modified bituminous strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

G. Bridge and cover isolation joints expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with overlapping modified bituminous strips.

H. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

I. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 INSTALLATION

A. General: Install modified bituminous sheets and accessory materials according to air-barrier manufacturer's written instructions and according to recommendations in ASTM D 6135.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous air-barrier sheet produced for low-temperature application. Do not install low-temperature sheet if ambient or substrate temperature is higher than 60 deg F.

B. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install modified bituminous strips centered over vertical inside corners. Install 3/4-inch fillets of termination mastic on horizontal inside corners.

C. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.

D. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

E. Apply and firmly adhere modified bituminous sheets horizontally over area to receive air barrier. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.

1. Apply sheets in a shingled manner to shed water without interception by any exposed sheet edges.
2. Roll sheets firmly to enhance adhesion to substrate.

F. Apply continuous modified bituminous sheets over modified bituminous strips bridging substrate cracks, construction, and contraction joints.

G. CMU: Install air-barrier sheet horizontally against the CMU beginning at base of wall. Align top edge of air-barrier sheet immediately below protruding masonry ties or joint reinforcement or ties, and firmly adhere in place.

1. Overlap horizontally adjacent sheets a minimum of 2 inches and roll seams.
2. Apply overlapping sheets with bottom edge slit to fit around masonry reinforcing or ties. Roll firmly into place.
3. Seal around masonry reinforcing or ties and penetrations with termination mastic.
4. Continue the membrane into all openings in the wall, such as doors and windows, and terminate at points to maintain an airtight barrier that is not visible from interior.

H. Seal top of through-wall flashings to air-barrier sheet with an additional 6-inch- wide, modified bituminous counterflashing strip.

I. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

J. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.

1. Coordinate air-barrier installation with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.

K. Connect and seal exterior wall air-barrier membrane continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

L. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip and preformed silicone-sealant extrusion so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.
2. Elastomeric Flashing Sheet: Apply adhesive to wall, frame, and flashing sheet. Install flashing sheet and termination bars, fastened at 6 inches o.c. Apply lap sealant over exposed edges and on cavity side of flashing sheet.
3. Preformed Silicone-Sealant Extrusion: Set in full bed of silicone sealant applied to walls, frame, and membrane.

M. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air-barrier membrane with foam sealant.

N. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.

O. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

P. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches beyond repaired areas in all directions.

Q. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

R. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements.

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air-barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.

4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed.
7. Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Air barrier has been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Tests: As determined by Owner's testing agency from among the following tests:

1. Quantitative Air-Leakage Testing: Air-barrier assemblies will be tested for air leakage according to ASTM E 783.
2. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 16 lbf/sq. in. according to ASTM D 4541 for each 600 sq. ft. of installed air barrier or part thereof.

D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.5 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 072713

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes metal plate wall panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical metal panel assembly as shown on Drawings, including supports, attachments, and accessories.
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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel assembly during and after installation.
8. Review procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/240 of the span.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 METAL PLATE WALL PANELS

A. Metal Plate Wall Panels: Provide factory-formed, metal plate wall panels fabricated from single sheets of metal formed into profile for installation method indicated. Include attachment assembly components, and accessories required for system.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Architectural Specialty Products, Inc.; Series 3000.
    b. Firestone Metal Products, LLC; UNA-FAB Series 3000.
    c. Industrial Building Panels, Inc.; 1200 Series Tech Clad.
    d. Metal Sales & Service, Inc.; Arcwall 1500.
    e. Protean Construction Products, Inc.; AP-1125 Panel.

B. Panel Depth: As indicated on Drawings.

C. Aluminum Sheet: Tension-leveled, smooth aluminum sheet, ASTM B 209, 0.125 inch thick.

1. Exterior Finish: Two-coat fluoropolymer.

    a. Color: Custom Color as selected by Architect.

D. Attachment Assembly: Rainscreen-principle system.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panelsas required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer. Provide sealant types that are compatible with panel materials, are nonstaining, and do not damage panel finish.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a seal and prevent metal-to-metal contact, and that minimize noise from movements.

2.5 FINISHES

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

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

B. Fasteners:

1. Aluminum Panels: Use stainless-steel fasteners for surfaces exposed to the exterior or in conjunction with steel framing.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Attachment Assembly, General: Install attachment assembly required to support metal plate wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended in writing by metal panel manufacturer.

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal plate wall panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.16

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes metal composite material wall panel rain-screen system.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Composite Material Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal composite material panel accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal composite material panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical metal composite material panel assembly 4’ square, including corner, soffits, supports, attachments, and accessories.
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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal composite material panels, and other manufactured items so as not to be damaged or deformed. Package metal composite material panels for protection during transportation and handling.

B. Unload, store, and erect metal composite material panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal composite material panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal composite material panels to ensure dryness, with positive slope for drainage of water. Do not store metal composite material panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal composite material panels during installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal composite material panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

A. Coordinate metal composite material panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal composite material panel Installer, structural-support Installer, and installers whose work interfaces with or affects metal composite material panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal composite material panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal composite material panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal composite material panel assembly during and after installation.
8. Review procedures for repair of panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite material panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal composite material panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/240 of the span.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 METAL COMPOSITE MATERIAL WALL PANELS

A. Metal Composite Material Wall Panel Systems: Provide factory-formed and -assembled, metal composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components, and accessories required for system.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. 3A Composites USA, Inc.; Alucobond.
    b. Alcoa Inc.; Reynobond ACM FR.
    c. CENTRIA Architectural Systems; Formabond Wall System.
    d. Firestone Metal Products, LLC; UNA-FAB Series 1500.

B. Aluminum-Faced Composite Wall Panels: Formed with a minimum of 0.020-inch- thick, coil-coated aluminum sheet facings.

1. Panel Thickness: 0.197 inch minimum.
2. Panel System Depth: Refer to Drawings.
3. Reveal Joint Width: 3/4 inch.
4. Core: `Fire retardant.
5. Exterior Finish: Three-coat fluoropolymer.

    a. Color: As selected by Architect from manufacturer's full range.

C. Attachment Assembly Components: Formed from [extruded aluminum] [material compatible with panel facing].

D. Attachment Assembly: Manufacturer's standard.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal composite material panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal composite material panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal composite materialpanelsas required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal composite material panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal composite material panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal composite material panels and remain weathertight; and as recommended in writing by metal composite material panel manufacturer.

2.4 FABRICATION

A. General: Fabricate and finish metal composite material panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal composite material panel joints with factory-installed captive gaskets or separator strips that provide a seal and prevent metal-to-metal contact, and that minimize noise from movements.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

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

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal composite material panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal composite material wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal composite material wall panel manufacturer.

a. Verify that air- and water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and assemblies penetrating metal composite material panels to verify actual locations of penetrations relative to seam locations of metal composite material panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install sub-framing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal composite material panel manufacturer's written recommendations.

3.3 METAL COMPOSITE MATERIAL PANEL INSTALLATION

A. General: Install metal composite material panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal composite material panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal composite material panels.
2. Flash and seal metal composite material panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal composite material panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal composite material panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal composite material panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use stainless-steel fasteners.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal composite material panel manufacturer.

D. Attachment Assembly, General: Install attachment assembly required to support metal composite material wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

E. Installation: Attach metal composite material wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.

1. Rainscreen Systems: Do not apply sealants to joints unless otherwise indicated.

F. Track-Support Installation: Install support assembly at locations, spacings, and with fasteners recommended by manufacturer. Use manufacturer's standard horizontal tracks and vertical drain channels that provide support and secondary drainage assembly, draining to the exterior at horizontal joints through drain tube. Attach metal composite material wall panels to tracks by interlocking panel edges with manufacturer's standard "T" clips.

1. Attach routed-and-returned flanges of wall panels to perimeter extrusions with manufacturer's standard fasteners.
2. Attach flush wall panels to perimeter extrusions by engaging panel edges and by attaching with manufacturer's standard structural silicone adhesive.
3. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
4. Do not apply sealants to joints unless otherwise indicated.

G. Rainscreen-Principle Installation: Install using manufacturer's standard assembly with vertical channel that provides support and secondary drainage assembly, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach metal composite material wall panels by inserting horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.

1. Install wall panels to allow individual panels to be installed and removed without disturbing adjacent panels.
2. Do not apply sealants to joints unless otherwise indicated.

H. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal composite material panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal composite material panel manufacturer; or, if not indicated, provide types recommended in writing by metal composite material panel manufacturer.

I. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal composite material wall panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal composite material wall panel installation, including accessories.

B. Metal composite material wall panels will be considered defective if they do not pass inspections.

C. Additional inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal composite material panel installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.

B. After metal composite material panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal composite material panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.23

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Adhered membrane roofing system.
2. Roof insulation.

B. Related Sections include the following:

1. Division 5 Section "Steel Decking" for roof deck (Bid Package 1).
2. Division 6 Section "Miscellaneous Rough Carpentry" for wood nailers, and blocking.
3. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
4. Division 7 Section "Roof Accessories" for roof hatch.
5. Division 7 Section "Joint Sealants."
6. Division 22 Section for roof drains and associated work.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

B. Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," before multiplication by a safety factor.

C. Factored Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," after multiplication by a safety factor.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1. Fire/Windstorm Classification: Class 1A-90.
2. Hail Resistance: MH.

D. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist the factored design uplift pressures calculated according to SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems."

1.5 SUBMITTALS

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

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

1. Base flashings and membrane terminations.
2. Tapered insulation layout, including slopes.
3. Insulation fastening patterns.

C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.

E. Qualification Data: For Installer and manufacturer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.

G. Research/Evaluation Reports: For components of membrane roofing system.

H. Maintenance Data: For roofing system to include in maintenance manuals.

I. Warranties: Special warranties specified in this Section.

J. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm with a minimum of 10 years experience to perform work of this Section, who has specialized in installing roofing similar to that required for this project, and who is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

B. Manufacturer Qualifications: A qualified manufacturer that has FMG approval for membrane roofing system identical to that used for this Project.

C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations: Obtain components for membrane roofing system from same manufacturer as roofing membrane or that are approved by roofing membrane manufacturer.

E. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class B minimum; ASTM E 108, for application and roof slopes indicated.

F. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories roof insulation fasteners cover boards walkway products and other components of membrane roofing system.
2. Warranty Period: 15 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, signed by Installer, covering Work of this Section, including all components of membrane roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: Uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced, and as follows:

1. Manufacturers:

a. Carlisle SynTec Incorporated.
b. Firestone Building Products Company.
c. GAF Materials Corporation.
d. Johns Manville International, Inc.
e. Sarnafil Inc.
f. Stevens Roofing Systems; Div. of JPS Elastomerics.

2. Thickness: 60 mils, nominal.
3. Exposed Face Color: White.
4. Physical Properties:

a. Breaking Strength: 225 lbf; ASTM D 751, grab method.
b. Elongation at Break: 15 percent; ASTM D 751.
c. Tearing Strength: 55 lbf minimum; ASTM D 751, Procedure B.
d. Brittleness Point: Minus 22 deg F.
e. Ozone Resistance: No cracks after sample, wrapped around a 3-inch- diameter mandrel, is exposed for 166 hours to a temperature of 104 deg F and an ozone level of 100 pphm; ASTM D 1149.
f. Resistance to Heat Aging: 90 percent minimum retention of breaking strength, elongation at break, and tearing strength after 166 hours at 240 deg F; ASTM D 573.

g. Water Absorption: Less than 4 percent mass change after 166 hours' immersion at 158 deg F; ASTM D 471.
h. Linear Dimension Change: Plus or minus 2 percent; ASTM D 1204.

2.3 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils thick, minimum, of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.

D. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

E. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick with 45-degree sealant pocket and anchors.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

G. Miscellaneous Accessories: Provide pourable sealers, mastics, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories as recommended and furnished by Manufacturer.

H. Perimeter termination bar sealant: See Division 7 Section "Joint Sealants."

2.4 ROOF INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.

1. Manufacturers:

a. Atlas Roofing Corporation.
b. Firestone Building Products Company.
c. Hunter Panels, LLC.
d. Johns Manville International, Inc.
e. RMAX.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches, with saddles and crickets sloped at 1/2 inch per 12 inches, unless otherwise indicated.

D. Insulation Thickness: As required to provide indicated drainage slopes, with a minimum in-service R-Value of 20.0 for the insulation only. Where tapered insulation is required, provide and average in-service R-Value of not less than 20.0 (insulation only) for each individual drainage area.

1. Minimum thickness at low point of slope for tapered insulation (roof drains and edges): 2 inch.

E. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.5 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

2.6 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck comply with requirements in Division 5 Section "Steel Decking."
4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
5. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
6. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is one inch or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Mechanically anchor all insulation layers to the structural metal deck as required by Manufacturer to resist design loads.

1. Fasten according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
2. Fasten to resist uplift pressure at corners, perimeter, and field of roof.
3. Fasten to roof deck in narrow, upper flutes of roof deck only – where fasteners do not encounter roof deck at insulation depth, remove fastener and re-install in adjacent upper deck flute.

3.4 ADHERED ROOFING MEMBRANE INSTALLATION

A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

1. Install sheet according to ASTM D 5036.

B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

E. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

F. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.

G. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

H. Install roofing membrane and auxiliary materials to tie in to existing roofing.

3.5 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with sheet flashing.

D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.6 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

C. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

D. Contractor is required to provide a final overall cleaning at the end of the project to remove all debris, clean all roof drains, and remove any and all stains embedded on membrane surface, either from glues or other contractors work.

END OF SECTION 075400

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following sheet metal flashing and trim:

1. Formed Copings, flashing and trim.
2. Manufactured reglets with counter-flashing.
3. Formed equipment support flashing.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for through-wall flashing, installing reglets, and other sheet metal flashing and trim.
2. Division 6 Section " Miscellaneous Carpentry" for wood nailers, curbs, and blocking.
3. Division 7 Sections "Metal Wall Panels" for composite metal wall panels and flashing and trim not part of sheet metal flashing and trim.
4. Division 7 Section "Thermoplastic Membrane Roof" for installing sheet metal flashing and trim integral with roofing membrane.
5. Division 7 Section "Roof Accessories" for manufactured roof specialties not part of sheet metal flashing and trim.
6. Division 7 Section "Joint Sealants" for field-applied sheet metal flashing and trim sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:

1. Wind Zone 1: For velocity pressures of 21 to 30 lbf/sq. ft.: 60-lbf/sq. ft. perimeter uplift force, 90-lbf/sq. ft. corner uplift force, and 30-lbf/sq. ft. outward force.

C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:

1. Identify material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12 inches long. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim: 12 inches long. Include fasteners and other exposed accessories.
3. Accessories: Full-size Sample.

D. Sample warranty.

1.5 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Single Source Materials: Obtain all metal products in this section, and in Division 7 Section "Metal Roof Panels", and in Division 7 Section "Metal Wall Panels" from a single manufacturer to ensure consistent color match.

C. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.7 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace sheet metal flashing & trim that does 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 Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace pre-finished metal that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion

PART 2 - PRODUCTS

2.1 SHEET METALS

A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with [**smooth, flat**] [**embossed**] surface.

1. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Color: As selected by Architect from manufacturer's full range.
3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Stainless steel wood screws, annular threaded nails, self-tapping screws, and other suitable fasteners designed to withstand design loads.

1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.

2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.

C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

D. Elastomeric Sealant: See Division 7 Section “Joint Sealants” for type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.3 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

E. Joints and Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form non-expansion and expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" and FMG Loss Prevention Data Sheet 1-49 for application but not less than thickness of metal being secured.

2.4 COPING SHEET METAL FABRICATIONS

A. Copings: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Match profile shown on the drawings. Fabricate joint splice plates of same thickness as copings. Furnish with continuous aluminum cleats to support edge of external leg (and internal leg if required) and drill elongated holes for mechanical fasteners on interior leg. Miter corners, seal, and shop-weld watertight.

1. Coping Profile: Match Detailed Drawings.

2. Joint Style: Butt, with 6-inch- wide concealed splice plates of same material, finish and profile as copings. Provide continuous butyl strips on either side of seam to prevent water migration under coping.
3. Aluminum Thickness: Minumum of 0.050 inch, unless noted otherwise.

2.5 BASE AND COUNTER-FLASHINGS

A. Fabricate from the following material:

1. Aluminum Thickness: Minumum of 0.040 inch, unless noted otherwise.

2.6 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cheney Flashing Company.
b. Fry Reglet Corporation.
c. Heckmann Building Products, Inc.
d. Hickman, W. P. Company.
e. Hohmann & Barnard, Inc.
f. National Sheet Metal Systems, Inc.

2. Material: Aluminum, 0.024 inch thick.
3. Surface-Mounted Type (where applicable): Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Masonry Type (where applicable): Provide with offset top flange for embedment in masonry mortar joint.
5. Accessories:

a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.

6. Finish: With manufacturer's standard color coating.

2.7 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are

not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
2. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.

C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

H. Seal joints with elastomeric sealant as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.

1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 16-inch centers.
2. Anchor interior leg of coping with screw fasteners and washers at 24-inch centers.
3. See “Coping Fabrication” section above for coping joint design.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.

3.4 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings,and pieces of flashing. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Roof hatch.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
2. Division 6 Section "Miscellaneous Carpentry" for roof sheathing, wood cants, and wood nailers.
3. Division 7 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated metal flashing and counterflashing, roof copings, expansion-joint covers, and miscellaneous sheet metal trim and accessories.
4. Division 7 Section "Thermoplastic Membrane Roofing" for associated roofing system.

1.3 SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.

C. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.

1.4 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing installation; and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers listed in other Part 2 articles.

2.2 METAL MATERIALS

A. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and prepainted by coil-coating process to comply with ASTM A 755.

1. Galvanized Steel Sheet: ASTM A 653, G90 coated.
2. Baked-Enamel Finish: AA-C12C42R1x; apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.

    a. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 1.5 mils, medium gloss.
    b. Color and Gloss: As selected by Architect from manufacturer's full range.

2.3 MISCELLANEOUS MATERIALS

A. Polyisocyanurate Board Insulation: ASTM C 1289, 1 inch thick.

2.4 ROOF HATCHES

A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated single-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.

1. Manufacturers:

    a. Babcock-Davis; a Nystrom, Inc. Company.
    b. Bilco Company (The).
    c. J. L. Industries, Inc.
    d. Milcor Inc.; a Gibraltar Company.

2. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loads.
3. Type and Size: Single-leaf lid 2’-6” by 8’-0” inches.
4. Curb and Lid Material: 11 gauge Aluminum.

    a. Finish: Mill Finish.

5. Insulation: Polyisocyanurate board.
6. Interior Lid Liner: Manufacturer's standard aluminum liner of same material and finish as outer metal lid.

7. Exterior Curb Liner: Manufacturer's standard aluminum liner of same material and finish as metal curb.
8. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
9. Fabricate units to minimum curb height of 16 inches, unless otherwise indicated.
10. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate hatch curbs with height tapered to match slope to level tops of units.
11. Hardware: Stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.

    a. Provide 2-point latch on covers larger than 84 inches.
    b. Provide remote-control operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
2. Verify dimensions of roof openings for roof accessories.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Install roof accessories to fit substrates and to result in watertight performance.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

E. Roof Hatch Installation:

1. Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.

F. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

3.3 CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION 077200

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:

1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:

a. Construction joints in cast-in-place concrete.
b. Control and expansion joints in unit masonry.
c. Joints in precast and cast stone.
d. Joints between metal panels, siding, expansion joint covers and sheet metal work.
e. Joints between different materials listed above.
f. Perimeter joints between materials listed above and frames of doors windows and louvers.
g. Other joints as indicated.

2. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings where indicated.
c. Tile control and expansion joints.
d. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
e. Gypsum board control and expansion joints.
f. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
g. Joints between plumbing fixtures and adjoining walls, floors, and counters.
h. Other joints as indicated.

3. Interior joints in the following horizontal traffic surfaces:

a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in tile flooring.
c. Other joints as indicated.

B. Related Sections include the following:

1. Division 8 Section "Glazing" for glazing sealants.
2. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
3. Division 9 Section "Tiling" for sealing tile joints.
4. Division 9 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.
5. Division 32 Section "Concrete Paving Joint Sealants" for sealing joints in pavements, walkways, and curbing.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

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. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

D. Qualification Data: For Installer.

E. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.

2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

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

1.7 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion unless otherwise indicated.
2. Warranty Period: 20 years from date of Substantial Completion for silicone and silyl-terminated polyether sealants.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturer: Subject to compliance with requirements, provide products by one of the manufacturers specified.

B. Manufacturers:

1. Polysulfide Sealant:

a. Pacific Polymers International, Inc.
b. Pecora Corp.
c. Sonneborn Building Products Div., ChemRex, Inc.
d. W.R. Meadows, Inc.

2. Silicone Sealant:

a. Bostik Findley, Inc.
b. Dow Corning Corp.
c. GE Silicones.
d. Pecora Corp.
e. Sonneborn Building Products Div., ChemRex, Inc.
f. Tremco.

3. Polyurethane Sealant:

a. Bostik Findley, Inc.
b. Pecora Corp.
c. Sika Corporation.
d. Sonneborn Building Products Div., ChemRex, Inc.
e. Tremco.

4. Butyl Rubber Sealant:

a. Bostik Findley, Inc.
b. Pecora Corp.
c. Sonneborn Building Products Div., ChemRex, Inc.
d. Tremco.

2.2 MATERIALS, GENERAL

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

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

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Basis-of-Design Products: Subject to compliance with requirements, provide the product specified below or an equivalent product by one of the other manufacturers specified for that type of sealant.

F. Multicomponent Nonsag Polysulfide Sealant: Sonneborn, Division of ChemRex, Inc.; Sonolastic Polysulfide Sealant.

1. Type and Grade: M (multicomponent) and NS (nonsag).
2. Class: 25.
3. Uses Related to Exposure: T (traffic).
4. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, concrete, brick, granite, limestone, marble, plastic, ceramic tile, and wood.

G. Multicomponent Pourable Polysulfide Sealant: Meadows, W. R., Inc.; Deck-O-Seal.

1. Type and Grade: M (multicomponent) and P (pourable).
2. Class: 25.
3. Uses Related to Exposure: T (traffic) and NT (nontraffic).
4. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, brick, granite, limestone, marble, and ceramic tile.

H. Single-Component Nonsag Acid-Curing Silicone Sealant: Dow Corning Corporation; 999-A Silicone Glazing Sealant (Clear).

1. Type and Grade: S (single component) and NS (nonsag).
2. Class: 25, high modulus.
3. Use Related to Exposure: NT (nontraffic).
4. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, plastic, and ceramic tile.

I. Single-Component Nonsag Mildew-Resistant Acid-Curing Silicone Sealant: Sonneborn, Division of ChemRex, Inc.; Sonolastic OmniPlus.

1. Type and Grade: S (single component) and NS (nonsag).
2. Class: 25, high modulus.
3. Use Related to Exposure: NT (nontraffic).
4. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, and ceramic tile.

J. Multicomponent Nonsag Urethane Sealant: Sonneborn, Division of ChemRex Inc.; Sonolastic NP 2.

1. Type and Grade: M (multicomponent) and NS (nonsag).
2. Class: 25.
3. Uses Related to Exposure: T (traffic) and NT (nontraffic).

4. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, concrete, brick, granite, limestone, stucco, marble, and ceramic tile.

K. Multicomponent Pourable Urethane Sealant: Sonneborn, Division of ChemRex, Inc.; Sonolastic SL 2.

1. Type and Grade: M (multicomponent) and P (pourable).
2. Class: 25.
3. Additional Movement Capability: +/- 25 percent.
4. Uses Related to Exposure: T (traffic).
5. Uses Related to Joint Substrates: M, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Galvanized steel, concrete, pavers, brick, granite, and marble.

L. Single-Component Nonsag Urethane Sealant: Sonneborn, Division of ChemRex, Inc.; Sonolastic NP 1.

1. Type and Grade: S (single component) and NS (nonsag).
2. Class: 25.
3. Additional Movement Capability: +/- 25 percent.
4. Uses Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, concrete, brick, granite, marble, ceramic tile, and wood.

2.4 SOLVENT-RELEASE JOINT SEALANTS

A. Butyl-Rubber-Based Solvent-Release Joint Sealant: Comply with ASTM C 1085; Pecora Corporation; BC-158 Butyl Rubber Sealant.

2.5 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove 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, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with

joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. 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 type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

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 according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

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

3.5 PROTECTION

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

3.6 JOINT-SEALANT SCHEDULE

A. Exterior Joints:

1.	General use	urethane, multi-component, nonsag.
2.	Wood/wood, wood/other	urethane, multi-component, nonsag.
3.	Metal/metal, metal/other	urethane, multi-component, nonsag.
4.	Masonry/masonry, masonry/other	urethane, multi-component, nonsag.
5.	Under metal door thresholds	butyl rubber, single component, nonsag.
6.	Horizontal wearing surfaces	see Division 32 Section "Concrete Paving Joint Sealants."
7.	Glazing	silicone, single component, nonsag.
8.	Subject to water immersion	polysulfide,multi-component, pourable or nonsag.

B. Interior Joints:

1.	General use	urethane, single component, nonsag.
2.	Plumbing fixtures, countertops, wet areas	silicone, single component, nonsag, mildew resistant.
3.	Ceramic tile	silicone, single component, nonsag, mildew resistant.
4.	Horizontal wearing surfaces	urethane, multi-component, pourable or nonsag.
5.	Under door thresholds	butyl rubber, single component, nonsag.

END OF SECTION 079200

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Hollow metal doors and frames.

B. Related Sections

1. Division 8 Section "Door Hardware" for door hardware for hollow metal doors.
2. Division 9 Sections "Painting" for field painting hollow metal doors and frames.
3. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
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. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

E. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to finish of 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 work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld International, LLC.
2. Ceco Door Products; a United Dominion Company.
3. Curries Company; an Assa Abloy Group company.
4. Republic Building Products.
5. Steelcraft; an Ingersoll-Rand company.

2.2 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; with minimum G60 or A60 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

H. Glazing: Comply with requirements in Division 8 Section "Glazing."

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: As indicated.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.

    a. Fire Door Core: As required to provide fire-protection ratings indicated.
    b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

        1) Locations: Exterior doors.

3. Vertical Edges for Single-Acting Doors: Beveled edge.

    a. Beveled Edge: 1/8 inch in 2 inches.

4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless).

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Frames for Level 3 Steel Doors: 0.053-inch- thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
4. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.
5. Frames for Wood Doors: 0.053-inch- thick steel sheet.
6. Frames for Borrowed Lights: Same as adjacent door frame.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.7 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.
3. 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.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight 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 butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

6. Door Silencers: Except on weather-stripped doors, 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.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 16 Sections.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.8 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/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, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable glazing stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb 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 hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops 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.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. 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.

END OF SECTION 081113

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Division 8 Section "Glazing" for glass view panels in flush wood doors.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings.

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. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.

a. Provide Samples for each species of veneer and solid lumber required.
b. Provide Samples for each color, texture, and pattern of plastic laminate required.
c. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.

3. Louver blade and frame sections, 6 inches long, for each material and finish specified.

4. Frames for light openings, 6 inches long, for each material, type, and finish required.

E. Sample Warranty: For special warranty.

F. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is a certified participant in AWI's Quality Certification Program.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.6 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.

1.7 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.

1.8 WARRANTY

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 Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flush Wood Doors

a. Algoma Hardwoods, Inc.
b. Eggers Industries; Architectural Door Division.
c. Lambton Doors.
d. Mohawk Flush Doors, Inc.; a Masonite Company.
e. Oshkosh Architectural Door Company.

f. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

C. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-1 or Grade LD-2, made with binder containing no urea-formaldehyde resin.
2. Provide doors with either glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

D. 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.

E. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.

F. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.

a. 5-inch top-rail blocking.
b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
c. 5-inch midrail blocking, in doors indicated to have armor plates.
d. 5-inch midrail blocking, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces.
2. Species and Cut: Maple quarter sawn.

3. Match between Veneer Leaves: Book match.
4. Assembly of Veneer Leaves on Door Faces: Match existing.
5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
6. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 20 feet or more.
7. Exposed Vertical Edges: Same species as faces or a compatible species.
8. Core: Particleboard.
9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
10. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 FABRICATION

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

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Finish doors at factory that are indicated to receive transparent finish.

D. Transparent Finish:

1. Grade: Premium.
2. Finish: WDMA TR-6 catalyzed polyurethane.
3. Effect: Open-grain finish.
4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

E. Thresholds: Set thresholds in full bed of sealant complying with requirements in Division 7 Section "Joint Sealants."

3.3 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 081416

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Access doors and frames for walls and ceilings.

B. Related Sections include the following:

1. Division 7 Section "Roof Accessories" for roof hatches.
2. Division 8 Section "Door Hardware" for mortise or rim cylinder locks and master keying.
3. Division 9 Section "Acoustical Panel Ceilings" for suspended acoustical panel ceilings.
4. Division 23 Section "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details materials, individual components and profiles, and finishes.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.

D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wall and Ceiling Access Doors:

a. Bar-Co, Inc. Div.; Alfab, Inc.
b. Cesco Products Div.; Mestek, Inc.
c. J. L. Industries, Inc.
d. Karp Associates, Inc.
e. Larsen's Manufacturing Company.
f. Milcor Limited Partnership.
g. Nystrom Building Products Co.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Cold-Rolled Steel Sheets: ASTM A 366, Commercial Steel (CS), or ASTM A 620, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568. Electrolytic zinc-coated steel sheet, complying with ASTM A 591, Class C coating, may be substituted at fabricator's option.

C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591, Commercial Steel (CS), with Class C coating and phosphate treatment to prepare surface for painting; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568 for uncoated base metal.

D. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

E. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 (AZM150) coated.

F. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use, mill finished.

G. Stainless-Steel Shapes or Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304 or Type 316, No. 2D finish.

H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 PAINT

A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."

B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Shop Primer for Metallic-Coated Steel: Organic zinc-rich primer complying with SSPC-Paint 20 and compatible with topcoat.

D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.4 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Babcock-Davis; A Cierra Products Co.
2. Jensen Industries.
3. J. L. Industries, Inc.
4. Larsen's Manufacturing Company.
5. Milcor Inc.
6. Nystrom, Inc.

B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet, stainless steel in areas subject to moisture and toilet rooms.

1. Locations: Wall and ceiling surfaces.
2. Door: Minimum 0.060-inch- thick sheet metal, set flush with exposed face flange of frame.
3. Frame: Minimum 0.060-inch- thick sheet metal with 1-inch- wide, surface-mounted trim.
4. Hinges: Continuous piano.
5. Latch: Cam latch operated by Cylinder and Key to match Owner's cylinder system.

C. Fire-Rated, Insulated, Flush Access Doors and Trimless Frames (where required): Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
5. Frame: Minimum 0.060-inch- thick sheet metal with drywall bead.
6. Hinges: Continuous piano.
7. Automatic Closer: Spring type.
8. Latch: Self-latching device operated by flush key or ring turn with interior release.

2.5 FABRICATION

A. General: Provide access door 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. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
2. For trimless frames with drywall bead for installation in gypsum board assembly, provide edge trim for gypsum board securely attached to perimeter of frames.
3. Provide mounting holes in frames to attach frames to metal or wood framing in plaster and drywall construction and to attach masonry anchors in masonry construction.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For doors with latches released by and locks operated by mortise cylinders, prepare access doors for cylinders specified in Division 8 Section "Door Hardware."

E. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.7 METALLIC-COATED STEEL FINISHES

A. Galvanizing of Steel Shapes and Plates: Hot-dip galvanize items indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.

B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. For galvanized surfaces, apply, after cleaning, a conversion coating suited to the organic coating to be applied over it. For metallic-coated surfaces, clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Factory Priming for Field-Painted Finish: Apply shop primer immediately after cleaning and pretreating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Electric-motor-operated overhead coiling grilles.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for miscellaneous steel supports.
2. Division 7 Section "Joint Sealants" for weatherproof joints at hoods.
3. Division 8 Section "Door Hardware" for lock cylinders and keying.
4. Division 26 and 27 Sections for electrical service and connections for powered operators, and accessories.

1.3 DEFINITIONS

A. Operation Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

1.4 PERFORMANCE REQUIREMENTS

A. Operation-Cycle Requirements: Provide overhead coiling grille components and operators capable of operating for not less than 20,000 cycles.

1.5 SUBMITTALS

A. Product Data: For each type and size of overhead coiling grille and accessory.

1. Summary of forces and loads on walls and jambs.

B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's product data.

C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available for units with factory-applied finishes.

D. Samples for Verification: Of each type of exposed finish required, prepared on Samples of size indicated below.

1. Grille Curtain: 12-inch- square assembly with rods, spacers, and vertical links.
2. Grille Curtain with Glazed Panels: Not less than 12-inch- square assembly with full-size panels.
3. Bottom Bar: 6 inches long.
4. Guides: 6 inches long.
5. Brackets: 6 inches square.
6. Hood: 6 inches square.

E. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain overhead coiling grilles through one source from a single manufacturer.

1. Obtain operators and controls from overhead coiling grille manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. Cookson Company.
2. Cornell Iron Works Inc.
3. Overhead Door Corp.
4. Raynor Garage Doors.
5. Wayne-Dalton Corp.

2.2 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

A. General: Fabricate overhead coiling grille curtain consisting of a network of 5/16-inch- minimum diameter horizontal rods, or rods covered with tube spacers, spaced as indicated. Interconnect rods by vertical links approximately 5/8 inch wide, spaced as indicated and rotating on rods.

1. Space rods at approximately 2 inches o.c.
2. Space links approximately 9 inches apart in a straight in-line pattern.
3. Aluminum Grille Curtain: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Endlocks: Continuous end links, chains, or other devices at ends of rods; locking and retaining grille curtain in guides against excessive pressures, maintaining grille curtain alignment, and preventing lateral movement.

C. Bottom Bar: Manufacturer's standard continuous channel, tubular shape, or two angles, finished to match grille.

1. Astragal: Provide a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene; for placement between angles or fitted to shape, as a cushion bumper for grille.
2. Provide motor-operated grilles with combination bottom astragal and sensor edge.

D. Grille Curtain Jamb Guides: Manufacturer's standard extruded-aluminum shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent over travel of curtain.

1. Removable Posts and Jamb Guides: Manufacturer's standard.

2.3 HOODS AND ACCESSORIES

A. Hood: Not required – hidden above ceiling.

B. Push/Pull Handles: For push-up-operated or emergency-operated grilles, provide manufacturer's standard lifting handles on each side of grille.

1. Provide pole hooks for grilles more than 84 inches high.

C. Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.

1. Lock cylinder is specified in Division 8 Section "Door Hardware."

D. If grille curtain is power operated, provide safety interlock switch to disengage power supply when grille is locked.

E. Mounting Tube Frame: Provide manufacturer's standard mounting tube frame designed to support grille; factory fabricated from structural-steel tubes; fastened to floor and structure above grille; to be built into wall construction; and complete with anchors, connections, and fasteners.

2.4 COUNTERBALANCING MECHANISM

A. General: Counterbalance grille curtain by means of adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to grille curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up grille curtain without distortion of curtain and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of grille curtain, with uniform adjustment accessible from outside barrel. Provide cast-steel barrel plugs to secure ends of springs to barrel and shaft.

D. Fabricate torsion rod for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate.

2.5 ELECTRIC GRILLE OPERATORS

A. General: Provide electric grille operator assembly of size and capacity recommended and provided by grille manufacturer for grille specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking grille, and accessories required for proper operation.

B. Comply with NFPA 70.

C. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging chain and sprocket operator and releasing brake for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

D. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.

E. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V, ac or dc.

F. Grille-Operator Type: Provide wall-, hood-, or bracket-mounted, jackshaft, gear-head-type grille operator unit consisting of electric motor, enclosed worm-gear running-in-oil primary drive, and chain and sprocket secondary drive; with quick disconnect-release for manual operation.

G. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motors complying with NEMA MG 1; with overload protection; sized to start, accelerate, and operate grille in either direction from any position, at not less than 2/3 fps and not more than 1 fps, without exceeding nameplate ratings or service factor.

1. Type: Polyphase, medium-induction type.
2. Service Factor: According to NEMA MG 1, unless otherwise indicated.
3. Coordinate wiring requirements and electric characteristics of motors with building electrical system.
4. Provide open dripproof-type motor, and controller with NEMA ICS 6, Type 1 enclosure.
5. Provide totally enclosed, nonventilated or fan-cooled motor, fitted with plugged drain, and controller with NEMA ICS 6, Type 4 enclosure where indicated.

H. Remote-Control Station: Provide sustained-pressure, three-button control station with push-button controls labeled "Open," "Close," and "Stop."

1. Provide two interior units, full-guarded, surface-mounted on opposite sides of door, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure, finished to be flush in wall construction.

I. Obstruction Detection Device: Provide each motorized grille with indicated external automatic safety sensor capable of protecting full width of grille opening. Activation of sensor immediately stops and reverses downward grille travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in grille opening without contact between grille and obstruction.

a. Self-Monitoring Type: Designed to interface with grille operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, grille closes only with sustained pressure on close button.

2. Sensor Edge: Provide each motorized grille with an automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor immediately stops and reverses downward grille travel. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

a. Provide pneumatically actuated automatic bottom bar.

1) Self-Monitoring Type: Four-wire configured device.

J. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop grille at fully opened and fully closed positions.

K. Provide electric operators with ADA-compliant audible alarm and visual indicator lights.

L. Emergency Egress Release: Provide grille with flush, wall-mounted handle mechanism, for ADA-compliant egress feature, not dependent on electric power, that allows grille to open to permit passage and automatically resets motor drive, without affecting limit switches, with return of handle to original position.

2.6 FINISHES, GENERAL

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install grilles and operating equipment, complete with necessary hardware, according to Shop Drawings, manufacturer's written instructions, and as specified.

3.2 ADJUSTING

A. Lubricate bearings and sliding parts; adjust grilles to operate easily, free of warp, twist, or distortion and with tight fit around entire perimeter.

3.3 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling grilles. Refer to Division 1 Section " Demonstration and Training."

END OF SECTION 083326

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes canopy/tilt-up bi-fold doors as indicated and scheduled on drawings and specified herein.

1.3 SUBMITTALS

A. Product data, roughing-in diagrams, and installation instructions for each type and size of industrial door. Include manufacturer's operating instructions and maintenance data.

B. Shop drawings are to indicate plans and elevations including opening dimensions and required tolerances, accessories and anchors, jamb details, connection details, anchorage spacing, hardware locations, and installation. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

1. Include location and installation requirements for electric operators.

C. Samples: Provide material samples for selection from the manufacturers full range of available colors, finishes and patterns. Provide 3-inch square color chips of paints.

D. Manufacturers Certificates: Certify products meet or exceed specified requirements.

E. Operations and Maintenance Data.

F. Wiring diagrams detailing power and control wiring. Differentiate between manufacturer-installed and field-installed wiring. Include motor size and voltage.

1.4 QUALITY ASSURANCE

A. Product Description: Provide each canopy/tilt-up industrial door including pedestrian doors as a complete unit produced by a single manufacturer, including frames, sections, brackets, guides, tracks, counterbalance mechanisms, hardware, operators, and installation accessories.

B. Installer Qualifications: Engage an experienced Installer with a minimum 5 (five) years experience and who is an authorized representative of the manufacturer.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 and AWS D1.3 "Structural Welding Code-Sheet Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturers unopened labeled packaging until ready for installation.

B. Store materials in a clean, dry, ventilated, weather-tight, and secure location.

1.6 PROJECT CONDITIONS

A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

B. Store Environmental Conditions: Prior to and during installation, environmental conditions shall be in accordance with door manufacturers latest published recommendations for temperature, rain, wind, humidity, ventilation, and illumination.

C. Opening shall be free and clear of debris, stored materials, scaffolding, and temporary walls as necessary for installers to perform the installation.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of operable glass-panel partitions that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of operable bi-fold door.
b. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. Renlita Doors North America, LLC. (220 E. 1st Street, Bonham, TX 75418 / 903-583-7500); Series S-2000 Hingeway Door.
2. Approved Equal.

2.2 DOOR PANEL CONSTRUCTION

A. Design Criteria: Two Leaf Hinged Counterbalanced Overhead Doors: Two horizontal panels hinged together, weather lapped at horizontal joint; rising vertically on roller and track system fixed to building structure to stack in a folded position under lintel.

B. Framework: Welded construction fabricated from rolled hollow section steel members with minimum wall thickness of 0.125 inch (3.1 mm). Beams shall be designed for maximum dead load deflection of 1/300th part of the span.

C. Counter Balancing: Counterweight system with enclosed counterweights suspended by 7/19 flexible multi-strand steel cables with minimum safety factor of 6:1. Cable shall be guided in steel sheaves with a minimum sheave to cable diameter ratio of 19:1. Sheaves shall be capable of carrying design loads.

D. Construct steel door sections from carbon steel hot rolled tube complying with ASTM A-513 Type 1 and ASTM A-36.

E. Counterweight Covers: Counterweights shall be protected and covered with a removable pressed sheet (aluminum or steel).

F. Manual Operation: If door motor is non-operational, provide a means for operating door manually, with sufficient safety devices to open and close the doors. Provide a keyed slide bar locking devices on the lower panel adjacent to the operating channel with safety interlock switch to disengage power supply when door is locked.

G. Size of Doors: Refer to drawings.

H. Locking: To be internal slide locks, with addition of manual Key Lock on lower panel with the safety interlock.

2.3 GLAZING AND CLADDING

A. Glazing: Glazed in accordance with AS1288.

1. Glass: 3/8 inch laminated safety glass.

2.4 HARDWARE

A. General: Provide manufacturers standard hardware and mechanisms.

2.5 FINISHES

A. Aluminum: Provide manufacturers powder coat finish, with custom color to be selected by Architect.

2.6 ELECTRIC DOOR OPERATORS

A. Furnish electric door-operator assembly of size and capacity recommended and provided by door manufacturer, complete with electric motor and factory-pre-wired motor controls, gear-reduction unit, solenoid-operated brake, remote-control stations and control devices.

B. Industrial Jackshaft Operator: Chamberlain Liftmaster Series J Industrial Jackshaft Operator.

1. Maintenance warning system notifies users when scheduled maintenance is due.
2. Motor: 1/2 HP switchless motor with the following:
   a. 115 volt.
   b. Single Phase.
   c. Separated high voltage wiring.
   d. Diagnostic LED’s.
3. Photo eye safety sensors.
4. Single wall button control station.
5. Warranty: 2 years.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine flooring, structural support, and opening for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. Procedure by the Installer of the Work, indicates acceptance of both the substrate and conditions under which Work is to be performed.

2. No Change Order shall be issued by the Architect to correct any unsatisfactory conditions reported, after procedure of the Work by the Installer.

3.2 INSTALLATION

A. General: Install door, track, and operating equipment complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports according to shop drawings, manufacturer's instructions, and as specified.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

C. Electrical Work: All wire, conduit, junction boxes, electrical disconnects, field wiring, and mounting of all electrical controls by others under Section: Field Electrical Wiring. The door manufacturer shall furnish all the controls (control panel, pushbuttons, limit switches, take-up reel, coil cord, etc.) but will not be required to install them.

D. Anchor assembly to wall construction and building framing without distortion or stress. .

E. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

F. Fit and align door assembly including hardware.

3.3 CLEANING, ADJUSTING, AND PROTECTION

A. Lubricate, test and adjust door assembly to smooth operation free from warp twist or distortion and in full contact with weather-stripping.

B. Clean doors, frames and glass.

C. Remove temporary labels and visible markings.

D. Protect installed products until completion of project.

E. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

3.4 DEMONSTRATION

A. Startup Services: Provide the services of a factory-authorized service representative to provide start-up service and to demonstrate and train Owner's representative.

1. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

2. Train Owner's representative on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventative maintenance.

3. Review data in the "Operating and Maintenance Manual."

END OF SECTION 083700

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Exterior and interior storefront framing.
2. Exterior manual-swing entrance doors.
3. Exterior glazed openings with operable vents.

B. Related Sections:

1. Division 8 Section “Aluminum Frames” for interior glazed partions.
2. Division 8 Section "Glazed Aluminum Curtain Walls" for curtain-wall systems that mechanically retain glazing on four sides.
3. Division 8 Section “Automatic Door Operators”.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Dimensional tolerances of building frame and other adjacent construction.
2. Failure includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferring to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
d. Noise or vibration created by wind and by thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Sealant failure.
g. Failure of operating units.
h. Failure or shrinkage of preformed gasketing material resulting in water entry into the framing.

B. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Seismic Loads: As indicated on Drawings.

C. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

E. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).

F. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

G. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

H. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 60 when tested according to AAMA 1503.

I. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.57 Btu/sq. ft. x h x deg F (3.23 W/sq. m x K) when tested according to AAMA 1503.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

F. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

G. Delegated-Design Submittal: For aluminum-framed 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. Detail fabrication and assembly of aluminum-framed systems.
2. Include design calculations.

H. Qualification Data: For qualified Installer.

I. Seismic Qualification Certificates: For aluminum-framed systems**,** accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

J. Welding certificates.

K. Preconstruction Test Reports: For sealant.

L. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

M. Source quality-control reports.

N. Quality-Control Program for Structural-Sealant-Glazed System: Include reports.

O. Field quality-control reports.

P. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

D. Quality-Control Program for Structural-Sealant-Glazed System: Develop quality control program specifically for Project. Document quality-control procedures and verify results for aluminum-framed systems. Comply with ASTM C 1401 recommendations including, but not limited to, system material-qualification procedures, preconstruction sealant-testing program, procedures for system fabrication and installation, and intervals of reviews and checks.

E. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

F. Preconstruction Sealant Testing: For structural-sealant-glazed systems, perform sealant manufacturer's standard tests for compatibility with and adhesion of each material that will come in contact with sealants and each condition required by aluminum-framed systems.

1. Test a minimum five samples each of metal, glazing, and other material.
2. Prepare samples using techniques and primers required for installed systems.
3. For materials that fail tests, determine corrective measures necessary to prepare each material to ensure compatibility with and adhesion of sealants including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

G. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

H. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

I. Structural-Sealant Glazing: Comply with ASTM C 1401, "Guide for Structural Sealant Glazing" for design and installation of structural-sealant-glazed systems.

J. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

K. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

L. Preinstallation Conference: Conduct conference at Project site.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed 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, but not limited to, excessive deflection.
b. Noise or vibration caused by thermal movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Adhesive or cohesive sealant failures.
e. Water leakage through fixed glazing and framing areas.
f. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Aluminum-framed entrances and storefronts are based on System 451 T by Kawneer North America; an Alcoa Company. Subject to compliance with requirements, provide the named product, or comparable products by one of the following:

1. EFCO
2. Kawneer North America; an Alcoa company.
3. United States Aluminum.
4. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel Company.
5. YKK AP America Inc.

B. Performance Requirements:

1. Air Infiltration: .06 cfm/ft. at 6.24 psf.
2. Water penetration: No leakage at 12.0 psf.
3. Structural: +/-60.00 psf.
4. CRF: 56.
5. U-Value: .63.

2.2 MATERIALS

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

1. Sheet and Plate: ASTM B 209.

2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. Jamb and head framing members shall be closed tubes, unless shop drawings can demonstrate adequate flanges for sealant and backer rod installation and a solid surface for terminating air barrier membrane.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads**,** finished to match framing system.

D. Concrete and Masonry Inserts (where applicable): Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 8 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Manufacturers standard heavy-duty, wide stile.
2. Door Construction: 2-inch overall thickness, with minimum 0.188-inch-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
b. Vertical members shall be sealed to prevent water entry from the top. Completed door assembly shall be designed to shed water to the exterior.

3. Door Design: As indicated.

a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.

4. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide non-removable glazing stops on outside of door.

B. Entrance Door Hardware: See Division 8 Section "Door Hardware” for additional door hardware not specified in this section.

2.6 ENTRANCE DOOR HARDWARE

A. See Division 8 Section “Door Hardware”

2.7 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."

1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.

3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

C. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

D. Storefront Framing: Fabricate components for assembly using shear-block system.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluorocarbon topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.

a. Color and Gloss: Custom Color As selected by Architect from manufacturer's full range of choices for color and gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated. Ensure that air barrier membranes and drainage planes in cavity walls are tied into the vertical jambs and horizontal sills of the storefront assembly.

a. Ensure that secondary drainage system is functional prior to sealant installation.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 8 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

3. Minimum Sealant Width: 3-8-inch.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-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.

END OF SECTION 084113

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. All-glass interior and exterior entrance doors.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for joint sealants installed at interface of all-glass systems and other building components.
2. Division 8 Section "Door Hardware" for lock cylinders installed in all-glass entrance locksets.

1.3 PERFORMANCE REQUIREMENTS

A. Provide systems, including anchorage, capable of withstanding loads indicated without structural failure, deflection exceeding specified limit, support components transferring stresses to glazing, and glazing-to-glazing or glazing-to-support contact as determined by structural analysis.

1. Structural Loads:

a. Wind Load: As indicated on Structural Drawings.
b. Seismic Load As indicated on Structural Drawings.

2. Deflection Normal to Glazing Plane: Limited to 1/175 of clear span or 3/4 inch, whichever is smaller.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details, including the following:

1. Plans, elevations, and sections.
2. Details of fittings and glazing.
3. Hardware quantities, locations, and installation requirements.
4. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Finishes: 6-inch- long sections of patch fittings, rails, and other items.
2. Glass: 6 inches square, showing exposed-edge finish.

D. Qualification Data: For professional engineer.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with all-glass systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of all-glass systems that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
1. Structural failures.
2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
3. Failure of operating components to function normally.

B. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Arch Aluminum & Glass Co., Inc.
2. Blumcraft of Pittsburgh.
3. Guardian Industries Corp./Float Glass Division.
4. Virginia Glass Products Corp.

2.2 MATERIALS

A. Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), tested for surface and edge compression per ASTM C 1048 and for impact strength per 16 CFR 1201 for Category II materials.

1. Class 1: Clear.
   a. Thickness: Minimum 5/8 inch or as required by structural performance.
   b. Locations: As indicated.

2. Exposed Edges: Flat polished.
3. Butt Edges: Flat ground.
4. Corner Edges: Mitered.

B. Aluminum: ASTM B 221, with strength and durability characteristics of not less than alloy 6063-T5.

1. Stainless-Steel Cladding: ASTM A 666, Type 302 or 304.

2.3 COMPONENTS

A. Patch Fittings: Stainless-steel-clad aluminum.

B. Floating Transom Bar: Steel, clad in metal matching fittings, and in size recommended by manufacturer for application indicated. Include stainless-steel support rods, lateral adjustment, and ceiling channel.

C. Accessory Fittings: Match patch fitting metal and finish for the following:

1. Center-housing lock.

D. Anchors and Fastenings: Concealed.

2.4 HARDWARE

A. General: Heavy-duty hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrances indicated. For exposed parts, match fitting metal and finish. As specified in Division 8 Section "Door Hardware."

2.5 FABRICATION

A. Provide holes and cutouts in glass to receive hardware, fittings, rails, and accessories 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, when installed, roll-wave distortion is parallel with bottom edge of door or lite.
2. Factory assemble components and factory install hardware to greatest extent possible.

2.6 STAINLESS STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish: Number 4 satin polish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install all-glass systems and associated components according to manufacturer's written instructions.

B. Set units level and plumb.

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.

3.3 ADJUSTING AND CLEANING

A. Adjust doors and hardware to produce smooth operation and tight fit at contact points and weather stripping.

B. Remove excess sealant and glazing compounds and dirt from surfaces.

END OF SECTION 084126

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes the following: Glazed aluminum curtain wall systems with insulated glass.

B. Primary components of the glazed wall system include:

1. Aluminum glazing and framing system.
2. Fixed glazing panels.
3. Exterior entrances.
4. Internal steel reinforcement.
5. Glazing gaskets.
6. Sills, copings, metal panels, trim, and similar border and filler items.
7. Anchors, shims, fasteners, inserts, accessories, and support brackets.
8. Joint Sealing within the curtain wall system; refer to Division 7 Section “Joint Sealers” for requirements.

C. Related Sections:

1. Division 5 Section “Metal Fabrications” for aluminum sheet at Shadowbox locations.
2. Division 7 Section "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain walls and for sealants to the extent not specified in this Section.
3. Division 8 Section "Glazing" for insulating glass requirements.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of manufacturer's standard glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings**.**

2. Seismic Loads: As indicated on the drawings.

D. Structural-Test Performance: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

    a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.

F. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).

G. Water Penetration under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).

1. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.

H. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Test Interior Ambient-Air Temperature: 75 deg F (24 deg C).
3. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.30 cfm/sq. ft. (1.50 L/s per sq. m) of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
4. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC- certified condensation resistance rating of no less than 55 as determined according to NFRC 500.

I. Sound Transmission: Provide glazed aluminum curtain walls with fixed glazing and framing areas having the following sound-transmission characteristics:

1. Outdoor-Indoor Transmission Class: Minimum 26 when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Delegated-Design Submittal: For glazed aluminum curtain walls and sun control devices indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Qualification Data: For qualified Installer.

F. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

G. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed energy performance requirements indicated and of documenting this performance by certification, labeling, and inclusion in lists.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

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 revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

E. Pre-Installation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. Special Assembly Warranty: Standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain walls that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals**,** metal finishes**,** and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Curtainwall systems are based on System 1600, System 1, by Kawneer North America; an Alcoa Company. Subject to compliance with requirements, provide the named products or comparable products by one of the following:

1. EFCO
2. Kawneer North America; an Alcoa Company.
3. United States Aluminum.
4. Vistawall Architectural Products.
5. YKK AP America Inc.

2.2 MATERIALS

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

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING

A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

D. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

E. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.

F. Framing Sealants: Manufacturer's standard sealants.

2.4 GLAZING

A. Glazing: Comply with Division 8 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer**.**

1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.6 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

C. Fabricate components that, when assembled, have the following characteristics:

1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Factory-Assembled Frame Units:

1. Rigidly secure non-movement joints.
2. Seal joints watertight unless otherwise indicated.
3. Install glazing to comply with requirements in Division 8 Section "Glazing."

E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer, fluoropolymer color coat, and clear

fluorocarbon topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.

a. Color and Gloss: Custom Color As selected by Architect from manufacturer's full range of choices for color and gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Division 8 Section "Glazing."

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6 mm in 12 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6 mm in 12 m).
3. Alignment:

a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.7 m); 1/2 inch (12.7 mm) over total length.

3.4 CLEANING AND PROTECTION

A. Clean all components promptly after installation.

B. Protect materials during and after installation.

END OF SECTION 084413

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware, power supplies, back-ups and surge protection.
3. Automatic operators.
4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Door Hardware Schedule”.
2. Division 08 Section “Hollow Metal Doors and Frames”.
3. Division 08 Section “Flush Wood Doors”.
4. Division 08 Section “All Glass Doors”.
5. Division 08 Section “Access Control Hardware”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 80 - Fire Doors and Windows.
4. NFPA 101 - Life Safety Code.
5. NFPA 105 - Installation of Smoke Door Assemblies.
6. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

   a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
   b. Complete (risers, point-to-point) access control system block wiring diagrams.

2. Electrical Coordination: Coordinate with related Division 26 Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 3 years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

D. Source Limitations: Obtain each type and variety of Door Hardware specified in this Section from a single source, qualified supplier unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

E. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:

1. NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:

a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.

b. Door Closers: Comply with the following maximum opening-force requirements indicated:

1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.

3. NFPA 101: Comply with the following for means of egress doors:

    a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.

    b. Thresholds: Not more than 1/2 inch high.

4. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C.

    a. Test Pressure: Positive pressure labeling.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for cylindrical locks and latches.
2. Five years for exit hardware.
3. Twenty five years for manual surface door closers.
4. Two years for electromechanical door hardware.
5. Five years product/hardware for all glass door hardware.
6. See Glass Door specification for Service Warranty for All Glass Doors.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Continuing Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance including repair and replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

1. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

a. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

B. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity, unless otherwise indicated:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:

    a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:

        1) Out-swinging exterior doors.
        2) Out-swinging access controlled doors.
        3) Out-swinging lockable doors.

5. Acceptable Manufacturers:

    a. Hager Companies (HA).
    b. McKinney Products (MK).
    c. Stanley Hardware (ST).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 certified continuous geared hinge with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Provide concealed flush mount (with or without inset), full surface, or half surface, in standard and heavy duty models, as specified in the Hardware Sets. Concealed continuous hinges to be U.L. listed for use on up to and including 90 minute rated door installations and U.L. listed for windstorm components where applicable. Factory cut hinges for door size and provide with removable service power transfer panel where indicated at electrified openings.

1. Acceptable Manufacturers:

    a. McKinney Products (MK).
    b. Pemko Manufacturing (PE).
    c. Stanley Hardware (ST).

C. Pivots: ANSI/BHMA A156.4, Grade 1, certified pivots provided either center hung or 3/4" offset type complete with top, bottom, and intermediate pivots (offset pivots only) in quantity according to manufacturer's recommendations. Space intermediate pivots equally not less than 25 inches on center apart or not more than 35 inches on center for doors over 121 inches high. Pivot hinges to have oil impregnated bronze bearing in the top pivot and a radial roller and thrust bearing in the bottom pivot with the bottom pivot designed to carry the full weight of the door. Pivots to be UL listed for windstorm where applicable.

1. Acceptable Manufacturers:

    a. ABH Manufacturing (AB).
    b. Dorma Products (DO).
    c. Rixson Door Controls (RF).

2.3 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified automatic, self-latching, and manual flush bolts and surface bolts. Manual flush bolts to be furnished with top rod of sufficient length to allow bolt location approximately six feet from the floor. Furnish dust proof strikes for bottom bolts. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

1. Acceptable Manufacturers:

    a. Door Controls International (DC).
    b. Ives (IV).
    c. Rockwood Manufacturing (RO).
    d. Trimco (TC).

B. Door Push Plates and Pulls: ANS/BHMA A156.6 certified door pushes and pulls of type and design specified below or in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with square corners and beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

    a. Acceptable Manufacturers:

        1) Ives (IV).
        2) Rockwood Manufacturing (RO).
        3) Trimco (TC).

2.4 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

1. Acceptable Manufacturers:

    a. Marshall Best – No Substitution Owner’s Standard.

C. Cylinders: Marshall Best Premium cylinders matching the owner’s existing system complying with the following:

1. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
5. Keyway: Match Facility Standard.

D. Keying System: Each type of lock and cylinders to be factory keyed. Conduct specified "Keying Conference" to define and document keying system instructions and requirements. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner. Incorporate decisions made in keying conference, and as follows:
1. Existing System: Master key or grand master key locks to Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:

1. Top Master Key: One (1)
2. Change Keys per Cylinder: Two (2)
3. Grand Master Keys (per Grand Master Key Group): Two (2)
4. Construction Keys (where required): Ten (10)
5. Construction Control Keys (where required): Two (2)
6. Permanent Control Keys (where required): Two (2)

F. Construction Keying: Provide construction master keyed cylinders or temporary keyed construction cores where specified. Provide construction master keys in quantity as required by project Contractor. Replace construction cores with permanent cores. Furnish permanent cores for installation as directed under specified "Keying Conference".

G. Key Registration List: Provide keying transcript list to Owner's representative in the proper format for importing into key control software.

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified cylindrical (bored) locksets furnished in the functions as specified in the Hardware Sets. Lock chassis fabricated of heavy gauge steel, zinc dichromate plated, with through-bolted application. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt. Locks are to be non-handed and fully field reversible.

1. Acceptable Manufacturers:

   a. Marshall Best – MB1A Series – No Substitution Owner’s Standard
   b. Alternate –
      1) Stanley Best (ST) – 93K Series
      2) Sargent Manufacturing (SA) – 10 Line
      3)

B. Lock Trim Design: As specified in Hardware Sets.

2.6 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.5.
4. Dustproof Strikes: BHMA A156.16.

2.7 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.

    a. Fire Exit Removable Mullions: Provide keyed removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions to be used only with exit devices for which they have been tested.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Flush End Caps: Provide heavy weight impact resistant flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.

5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty trim with cold forged escutcheons, beveled edges, and four threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets. Provided free-wheeling type trim where indicated.
    b. Where function of exit device requires a cylinder, provide an interchangeable core type keyed cylinder (Rim or Mortise) as specified in Hardware Sets.

6. Vertical Rod Exit Devices: Provide and install interior surface and concealed vertical rod exit devices as Less Bottom Rod (LBR) unless otherwise indicated.

7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.

8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

9. Rail Sizing: Provide exit device rails factory sized for proper door width application.

10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Mounting rails to be formed from smooth stainless steel, brass or bronze architectural materials no less than 0.072" thick, with push rails a minimum of 0.062" thickness. Painted or aluminum metal rails are not acceptable. Exit device latch to be investment cast stainless steel, pullman type, with deadlock feature.

1. Acceptable Manufacturers:

    a. Marshall Best – Q1100/QF1100 Series – No Substitution Owner's Standard
    b. Alternate –
        1) Sargent Manufacturing (SA) – 80 Series

2) Von Duprin (VD) - 35A/98 XP Series.

2.8 ELECTROMECHANICAL CONVENTIONAL EXIT DEVICES

A. Electrified Conventional Push Rail Devices (Heavy Duty): Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified below.

a. Marshall Best – Q1100/QF1100 Series – No Substitution Owner's Standard
b. Alternate –
1) Sargent Manufacturing (SA) – 80 Series
2) Von Duprin (VD) - 35A/98 XP Series.

B. Electrified Options: As indicated in hardware sets, provide electrified exit device options including: electric latch retraction , electric dogging, outside door trim control, exit alarm, delayed egress, latchbolt monitoring, lock/unlock status monitoring, touchbar monitoring and request-to-exit signaling. Unless otherwise indicated, provide electrified exit devices standard as fail secure.

2.9 PUSH BAR PANIC DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. Panic device shall be 1 ¼" diameter.
2. Panic mechanism shall be concealed within the stainless steel tubing and the latch bolt is retracted by pushing the interior "L" shaped panic bar.
3. Entrance from keyed cylinder.
4. Dogging shall be standard and conveniently located with a built-in dogging pin that keeps the latch bolt in the retracted position and the panic bar fixed.

B. Acceptable Manufacturers:
1. CRL / Blumcraft (CR)
2. PRL Glass Systems (PL)

2.10 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C and UBC 7-2 for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 10 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

a. Where closers are indicated to have mechanical dead-stop, provide heavy duty arms and brackets with an integral positive stop.
b. Where closers are indicated to have mechanical hold open, provide heavy duty units with an additional built-in mechanical holder assembly designed to hold open against normal wind and traffic conditions. Holder to be manually selectable to on-off position.
c. Where closers are indicated to have a cushion-type stop, provide heavy duty arms and brackets with spring stop mechanism to cushion door when opened to maximum degree.
d. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics. Provide drop plates or other accessories as required for proper mounting.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt or security type fasteners as specified in the door Hardware Sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Acceptable Manufacturers:

a. Marshall Best – QDC 40 Series – No Substitution Owner's Standard
b. Alternate –
1) LCN Closers (LC) - 4040XP Series.
2) Sargent Manufacturing (SA) – 350 Series.

2.11 AUTOMATIC DOOR OPERATORS

A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Electrohydraulic Door Operators: Self-contained low-pressure units with rack and pinion design contained within a cast aluminum housing. Door closing speed controlled by independent hydraulic adjustment valves in the sweep and latch range of the closing cycle. Operator is to provide conventional door closer opening and closing forces unless the power operator motor is activated. Unit is to include an adjustable hydraulic backcheck valve to cushion the door speed if opened violently. Non-handed units for both push and pull side applications.

C. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

D. Standard: Certified ANSI/BHMA A156.19.

1. Performance Requirements:

a. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
b. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

E. Configuration: Surface mounted. Door operators to control single swinging and pair of swinging doors.

F. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.

1. On-off switch to control power to be key switch operated.

G. Features: Operator units to have full feature adjustments for door opening and closing force and speed, back-check, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

H. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

I. Activation Devices: Provide activation devices in accordance with ANSI/BHMA A156.19 standard, for condition of exposure indicated and for long term, maintenance free operation under normal traffic load operation. Coordinate activation control with electrified hardware and access control interfaces. Activation switches basis of design is as follows:

1. The ‘INGRESS’R’ as manufactured by Wikk AccessAbility, 36 inch tall tapered design, hardwired.

J. Signage: As required by cited ANSI/BHMA A156.19 standard for the type of operator.

1. Acceptable Manufacturers:

a. LCN Closers (LC) - 4640 Series.
b. Norton Closers (NO) – 6000 Series.

2.12 CONCEALED FLOOR OPERATORS

A. Manufacturer’s specialized unit to adapt the ED 400 automatic swing door operator to underground use. The converter shall be mounted beneath the door leaf and jamb area utilizing a standard 2 ¾” or 3 ¾” pivot setback. Reference shop drawings and templates for offset hung or center hung application. Heavy-duty pivot shall incorporate 1200 pound rated, sealed thrust bearings in 1” steel bearing plate. Bottom door arm (push or pull type) shall mount within bottom rail of swing door. Drive transfer between converter and operator shall be manufacturer’s standard chain drive with tensioner.
1. Converter shall not impede manual operation of swing door.
2. Converter shall not impede ANSI compliance of operator.
3. Converter shall not impede operation of automatic door operator.

B. Cement Case shall be sheet steel (ASTM-A-570 Grade A) formed and riveted type with galvanized coating (A568/A568M). Cement case shall incorporate a vinyl gasket at the perimeter of the cement can cover, and a shaft seal as a water and moisture barrier. Unit accommodates threshold floors, stone floors, and other floor conditions.

1. Cement case shall be encased below grade as detailed on shop drawings, utilizing (quick-set or pour-stone or equal) setting cement. A minimum 3/8” of setting cement shall be placed at all exterior vertical surfaces and along the entire bottom surface. Allow setting cement to cure as required by cement product manufacturer prior to installing door leaf.
2. Cement case shall be field bored to accept liquid-tight conduit connections for electric power service and signal wires. Conduit, conduit connections, electric power service and signal wire to unit is furnished and installed by others as specified in electrical specification section.

C. Operator Manufacturer shall be:
DORMA Automatics, Inc
ED 400 Electro-Mechanical Swing Door Operator
ED 400 IG Swing Door Operator

2.13 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Metal Protection Plates: ANSI/BHMA A156.6 certified metal protection plates (kick, armor, or mop), beveled on four edges (B4E), fabricated from the following.

a. Stainless Steel: 050-inch thick, with countersunk screw holes (CSK).

4. Fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets.

5. Acceptable Manufacturers:

a. Burns Manufacturing (BU).
b. Ives (IV).
c. Rockwood Manufacturing (RO).
d. Trimco (TC).

2.14 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Acceptable Manufacturers:

a. Burns Manufacturing (BU).
b. Ives (IV).
c. Rockwood Manufacturing (RO).

d. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Acceptable Manufacturers:

a. ABH Manufacturing (AB).
b. Rixson Door Controls (RF).
c. Rockwood Manufacturing (RO).
d. Sargent Manufacturing (SA).

2.15 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Acceptable Manufacturers:

1. National Guard Products (NG).
2. Pemko Manufacturing (PE).
3. Reese Enterprises, Inc. (RS).

2.16 ELECTRONIC ACCESSORIES

A. Key Switches: Key switches furnished standard with stainless steel single gang face plate with a 12/24VDC bi-color LED indicator. Integral backing bracket permits integration with any 1 1/4" or 1 1/2" mortise type cylinder. Key switches available as momentary or maintained action and in narrow face plate options.

1. Acceptable Manufacturers:

a. Locknetics (LO).
b. Security Door Controls (SD) - 800 Series.
c. Securitron (SU) - MK Series.

B. Push-Button Switches: Industrial grade momentary or alternate contact, back-lighted push buttons with stainless-steel switch enclosures. 12/24 VDC bi-color illumination suitable for either flush or surface mounting.

1. Acceptable Manufacturers:

a. Locknetics (LO).
b. Security Door Controls (SD) - 400 Series.
c. Securitron (SU) - PB Series.

C. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Acceptable Manufacturers:

a. Locknetics (LO).
b. Sargent Manufacturing (SA) – 3280 Series.
c. Security Door Controls (SD) - DPS Series.
d. Securitron (SU) - DPS Series.

D. Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Acceptable Manufacturers:

a. Marshall Best (MB) – PSQ Series.
b. Securitron (SU) - BPS Series.

2.17 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.18 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SCHEDULE

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. Refer to Section 080671, Door Hardware Schedule, for hardware sets.

C. Manufacturer’s Abbreviations:

1. MK - McKinney
2. RF - Rixson
3. DO - Dorma Door Controls Inc
4. RO - Rockwood
5. AD - Adams Rite
6. MB – Marshall Best
8. HS - HES
9. FO - Folger Adam
11. WA – Wikk AccessAbility
12. NO - Norton
13. PE - Pemko

15. SU – Securitron
16. PL – PRL Glass Systems

Hardware Schedule

Set: 1.0

Doors: 100-1

Description: Exterior - Card Reader / Auto Operator (Alum)

1	Pivot Set	147	626	RF
1	Pivot	M19	626	RF
1	Exit Device	ELR-Q1100 x Night Latch Cyl x SFIC Premium Keyway	626	MB
1	Pull	RM2120-60	US32D	RO
1	Door Operator	6030	689	NO
1	Activator	I-36-5	Clear	WA
1	Threshold	2005AV ES14L		PE
1	Sweep	3452AV		PE
1	Electric Power Transfer	CEPT-10		SU
1	Position Switch	DPS-M-BK		SU
2	Door Switch	501		NO
1	Power Supply	PSQ101-2		MB

Notes: * Weatherstrip supplied with aluminum frame & door.
* Card Reader supplied in Division _____.
* Coordinate all wiring & conduit with the electrical contractor.
* Door contacts monitor the position of the doors and reports status to the security system.
* Mode of Operation: Day/Unlock Mode - The exit device will be electronically dogged down through the EAC system. The door can be entered or exited manually or either exterior or interior wall actuator can be pressed and automatic operator will open the door.
Night/Locked Mode - The exit device is latch/secured through the EAC system and will de-activate the exterior wall actuator. When the correct credential is presented to the card reader the electric strike will release and exterior wall actuator will be activated. The door can manually be opened or the wall actuator can be pressed and automatic operator will open the door. The interior wall actuator can be pressed at any time and electric strike will release and automatic operator will open the door. Manual egress is allowed at all times.

Set: 2.0

Doors: 100-2, 100-3

Description: Exterior - Exit Device

1	Pivot Set	147	626	RF
1	Pivot	M19	626	RF
1	Exit Device (exit only)	ELR-Q1100 x SFIC Premium Cylinder	626	MB
1	Pull	RM2120-60	US32D	RO

1	Concealed Overhead Stop	1-X36	630	RF
1	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
1	Threshold	2005AV ES14L		PE
1	Sweep	3452AV		PE
1	Electric Power Transfer	CEPT-10		SU
1	Position Switch	DPS-M-BK		SU
1	Power Supply	PSQ101-2		MB

Notes: * Weatherstrip supplied with aluminum frame & door.
* Coordinate and provide any special templating required for closer and overhead stop.
* Door contacts monitor the position of the doors and reports status to the security system.
* Mode of Operation: Day/Unlock Mode - The exit device will be electronically dogged down through the EAC system. The door can be entered or exited manually.
Night/Locked Mode - The exit device is latch/secured through the EAC system. Manual egress is allowed at all times.

Set: 3.0

Doors: 102-1, 102-2

Description: Exterior - Exit Device with Cylinder

1	Pivot Set	147	626	RF
1	Pivot	M19	626	RF
1	Exit Device	ELR-Q1100 x Night Latch Cyl x SFIC Premium Keyway	626	MB
1	Pull	RM2120-60	US32D	RO
1	Concealed Overhead Stop	1-X36	630	RF
1	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
1	Threshold	2005AV ES14L		PE
1	Sweep	3452AV		PE
1	Electric Power Transfer	CEPT-10		SU
1	Position Switch	DPS-M-BK		SU
1	Power Supply	PSQ101-2		MB

Notes: * Weatherstrip supplied with aluminum frame & door.
* Coordinate and provide any special templating required for closer and overhead stop.
* Door contacts monitor the position of the doors and reports status to the security system.
* Mode of Operation: Day/Unlock Mode - The exit device will be electronically dogged down through the EAC system. The door can be entered or exited manually.
Night/Locked Mode - The exit device is latch/secured through the EAC system. Manual egress is allowed at all times.

Set: 4.0

Doors: 104-1

Description: Exterior - Pair - Card Reader / Auto Operator (All Glass)

2	Top Pivot	80622	626	DO
2	Push Bar Panic Device	PL100F	US32D	PL
3	Cylinder (mortise)	MBS-ICM x Verify Cam x SFIC Premium Keyway	626	BE
1	Electric Strike	310-1-F-24D	US32D	FO
2	Concealed Overhead Stop	1-X36	630	RF
1	Floor Closer	BTS80 x SC-1	689	DB
1	Automatic Floor Operators	ED400-IG	689	DO
1	Activator	I-36-5	Clear	WA
1	Threshold	2549A ES14L		PE
2	Position Switch	DPS-M-BK		SU
2	Door Switch	501		NO
1	Keyswitch	MKAN2		SU
1	Power Supply	BPS-1		SU

Notes: * Weatherstrip supplied with aluminum frame & door.
* Card Reader supplied in Division _____.
* Coordinate all wiring & conduit with the electrical contractor.
* Card Reader and Wall Actuator to be mounted on chimney wall (see drawing sheet A-101 for locations).
* Door contacts monitor the position of the doors and reports status to the security system.
* Mode of Operation: Day/Unlock Mode - The exit device will be manually dogged down and the key switch will be in the "on" position which will activate the exterior wall actuator. The door can be entered or exited manually or either exterior or interior wall actuator can be pressed and automatic operator will open the door.
Night/Locked Mode - The exit device is latch/secured and the key switch is in the "off" position which will de-activate the exterior wall actuator. When the correct credential is presented to the card reader the electric strike will release and exterior wall actuator will be activated. The door can manually be opened or the wall actuator can be pressed and automatic operator will open the door. The interior wall actuator can be pressed at any time and electric strike will release and automatic operator will open the door. Manual egress is allowed at all times.

Set: 5.0

Doors: 114-1

Description: Exterior - Pair - Card Reader / Exit Alarm (Alum)

2	Pivot Set	147	626	RF
2	Pivot	M19	626	RF
1	Mullion	Keyed Removable x SFIC Premium Cylinder	SP28	MB
1	Rim Exit Device w/alarm	Q1100 AL x Night Latch Cyl x SFIC Premium Cylinder	626	MB
1	Rim Exit Device w/alarm	Q1100 AL x SFIC Premium Keyway	626	MB

1	Electric Strike	9400	630	HS
1	ElectroLynx Adaptor	2004M		HS
1	SMART Pac Bridge Rectifier	2005M3		HS
2	Pull	RM2120-60	US32D	RO
2	Concealed Overhead Stop	1-X36	630	RF
2	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
1	Threshold	2005AV ES14L		PE
2	Sweep	3452AV		PE
2	Position Switch	DPS-M-BK		SU
1	Power Supply	BPS-1		SU

Notes: * Weatherstrip supplied with aluminum frame & door.
* Card Reader supplied in Division _____.
* Coordinate all wiring & conduit with the electrical contractor.
* Door contacts monitor the position of the doors and reports status to the security system.
* Mode of Operation: Pull/Secure Side of Door - The doors will be locked and alarms on exit devices will be turned on. When the correct credential is presented to the card reader the electric strike will release and active door can be pulled open. Push/Interior Side of Door - Cylinders in exit alarms are turned on. When an unauthorized person pushes the exit device push bars the auditable alarm will sound. When authorized person uses key and turns cylinder alarm can be by-passed for authorized egress. Manual egress is allowed at all time except alarm could sound.

Set: 6.0

Doors: 115-1

Description: Exterior - Pair - Card Reader / Auto Operator (Alum)

2	Pivot Set	147	626	RF
2	Pivot	M19	626	RF
1	Mullion	Keyed Removable x SFIC Premium Cylinder	SP28	MB
1	Exit Device	ELR-Q1100 x Night Latch Cyl x SFIC Premium Keyway	626	MB
1	Exit Device (exit only)	ELR-Q1100 x SFIC Premium Cylinder	626	MB
2	Pull	RM2120-60	US32D	RO
1	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
1	Door Operator	6030	689	NO
1	Threshold	2005AV ES14L		PE
2	Sweep	3452AV		PE
2	Electric Power Transfer	CEPT-10		SU
2	Position Switch	DPS-M-BK		SU
2	Door Switch	501		NO
1	Power Supply	PSQ101-2		MB

Notes: * Weatherstrip supplied with aluminum frame & door.
* Card Reader supplied in Division _____.
* Coordinate all wiring & conduit with the electrical contractor.

* Door contacts monitor the position of the doors and reports status to the security system.
* Mode of Operation: Day/Unlock Mode - The exit device will be electronically dogged down through the EAC system. The door can be entered or exited manually or either exterior or interior wall actuator can be pressed and automatic operator will open the door.
Night/Locked Mode - The exit device is latch/secured through the EAC system and will de-activate the exterior wall actuator. When the correct credential is presented to the card reader the electric strike will release and exterior wall actuator will be activated. The door can manually be opened or the wall actuator can be pressed and automatic operator will open the door. The interior wall actuator can be pressed at any time and electric strike will release and automatic operator will open the door. Manual egress is allowed at all times.

Set: 7.0

Doors: 116-1

Description: Exterior - Pair - Card Reader / Wide Doors (HM)

1	Continuous Hinge	MCK-12HD	CL	MK
1	Continuous Hinge	MCK-12HD EPT	CL	MK
1	Dust Proof Strike	570	US26D	RO
1	Flush Bolt	2845	US26D	RO
1	Storeroom Lock	MB1A-3-02-15 x SFIC Premium Keyway	626	MB
1	Electric Strike	1006	630	HS
1	ElectroLynx Adaptor	2004M		HS
1	SMART Pac Bridge Rectifier	2005M3		HS
2	Concealed Overhead Stop	1-X36	630	RF
2	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
2	Kick Plate	K1050 8" x 1" LDW BE CSK	US32D	RO
1	Threshold	2005AV ES14L		PE
1	Gasketing	2891APK		PE
2	Sweep	3452AV		PE
1	Astragal	357SP		PE
2	Position Switch	DPS-M-BK		SU
1	Push Button	PB4L-2		SU
1	Power Supply	BPS-1		SU

Notes: * Install astragal on pull side of active leaf.
* Locate pushbutton in Office 113B.
* Card Reader supplied in Division _____.
* Coordinate all wiring & conduit with the electrical contractor.
* Door contacts monitor the position of the doors and reports status to the security system.
* Mode of Operation: When the correct credential is presented to the card reader or the push button located in Office 113B is pressed the electric strike will release and the active door can be opened. Manual egress is allowed at all times.

Set: 8.0

Doors: 117

Description: Exterior - Pair -Storeroom Set - Wide Doors (HM)

2	Continuous Hinge	MCK-12HD	CL	MK
1	Dust Proof Strike	570	US26D	RO
1	Flush Bolt	2845	US26D	RO
1	Storeroom Lock	MB1A-3-02-15 x SFIC Premium Keyway	626	MB
2	Concealed Overhead Stop	1-X36	630	RF
2	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
1	Threshold	2005AV ES14L		PE
1	Gasketing	2891APK		PE
2	Sweep	3452AV		PE
1	Astragal	357SP		PE
2	Position Switch	DPS-M-BK		SU

Notes: * Install astragal on pull side of active leaf.
* Coordinate all wiring & conduit with the electrical contractor.
* Door contacts monitor the position of the doors and reports status to the security system.

Set: 9.0

Doors: 100-4

Description: Interior - Push/Pull / Auto Operator

1	Pivot Set	147	626	RF
1	Pivot	M19	626	RF
1	Push/Pull Set	RM2120-60 x Back-to-Back Mount	US32D	RO
1	Concealed Overhead Stop	1-X36	630	RF
1	Door Operator	6030	689	NO
2	Door Switch	501		NO

Notes: * Coordinate all wiring & conduit with the electrical contractor.
* Mode of Operation: When either wall actuator is pressed the automatic operator will open the door.

Set: 10.0

Doors: 104-2

Description: Interior - Pair - Push.Pull / Operator (All Glass)

2	Top Pivot	80622	626	DO
2	Pull	RM2120-60	US32D	RO
2	Push Bar	RM412	US32D	RO
2	Concealed Overhead Stop	1-X36	630	RF
1	Floor Closer	BTS80 x SC-1	689	DB
1	Automatic Floor Operators	ED400-IG	689	DO
1	Activator	I-36-5	Clear	WA
2	Door Switch	501		NO

Notes: * Coordinate all wiring & conduit with the electrical contractor.
* Mode of Operation: When either wall actuator is pressed the automatic operator will open the door.

Set: 11.0

Doors: 100-5, 100-6

Description: Interior - Push/Pull (Alum)

1	Pivot Set	147	626	RF
1	Pivot	M19	626	RF
1	Push/Pull Set	RM2120-60 x Back-to-Back Mount	US32D	RO
1	Concealed Overhead Stop	1-X36	630	RF
1	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC

Set: 12.0

Doors: 110, 112A-1, 112A-2

Description: Interior - Push/Pull

4	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Push Plate	70E	US32D	RO
1	Pull	RM202	US32D	RO
1	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
1	Kick Plate	K1050 8" x 2" LDW BE CSK	US32D	RO
1	Wall Stop	400	US26D	RO
3	Silencer	608		RO

Set: 13.0

Doors: 115-2

Description: Interior - Pair - Push/Pull / Auto Operator

1	Pivot Set	147	626	RF
2	Pivot	M19	626	RF
2	Push/Pull Set	RM2120-60 x Back-to-Back Mount	US32D	RO
2	Concealed Overhead Stop	1-X36	630	RF
1	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
1	Door Operator	6030	689	NO
2	Door Switch	501		NO

Notes: * Coordinate all wiring & conduit with the electrical contractor.
* Mode of Operation: When either wall actuator is pressed the automatic operator will open the door.

Set: 14.0

Doors: 111

Description: Interior - Privacy Set w/indicator

4	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Privacy Set	MB1A-3-20-15	626	MB
1	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
1	Kick Plate	K1050 8" x 2" LDW BE CSK	US32D	RO
1	Wall Stop	400	US26D	RO
3	Silencer	608		RO

Set: 15.0

Doors: 107, 113C, 113D

Description: Interior - Storeroom Set

4	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	MB1A-3-02-15 x SFIC Premium Keyway	626	MB
1	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
1	Kick Plate	K1050 8" x 2" LDW BE CSK	US32D	RO
1	Wall Stop	400	US26D	RO
3	Silencer	608		RO

Set: 15.1

Doors: 102A-5
Description: Interior - Storeroom Set / No Closer

4	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	MB1A-3-02-15 x SFIC Premium Keyway	626	MB
1	Wall Stop	400	US26D	RO
3	Silencer	608		RO

Set: 16.0

Doors: 108-1
Description: Interior - Pair - Storeroom Set

8	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Flush Bolt	2805 / 2905 (type as applicable)	US26D	RO
1	Storeroom Lock	MB1A-3-02-15 x SFIC Premium Keyway	626	MB
2	Concealed Overhead Holder	1-X26	630	RF
1	Astragal	357SP		PE
2	Silencer	608		RO

Notes: * Install astragal on pull side of active leaf.

Set: 16.1

Doors: 114B
Description: Interior - Pair - Storeroom Set / No Closer

8	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Flush Bolt	2805 / 2905 (type as applicable)	US26D	RO
1	Storeroom Lock	MB1A-3-02-15 x SFIC Premium Keyway	626	MB
2	Concealed Overhead Holder	1-X26	630	RF
1	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
1	Astragal	357SP		PE
2	Silencer	608		RO

Notes: * Install astragal on pull side of active leaf.

Set: 17.0

Doors: 108-2

Description: Interior - Pair - Storeroom Set

7	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Thru-Wire Hinge	TA2714 CC4 4-1/2" x 4-1/2"	US26D	MK
1	Flush Bolt	2805 / 2905 (type as applicable)	US26D	RO
1	Storeroom Lock	MB1A-3-02-15 x SFIC Premium Keyway	626	MB
1	Electric Strike	1006	630	HS
2	Concealed Overhead Holder	1-X26	630	RF
1	Astragal	357SP		PE
2	Silencer	608		RO
2	Position Switch	DPS-M-BK		SU
1	Power Supply	BPS-1		SU

Notes: * Install astragal on pull side of active leaf.
* Card Reader supplied in Division _____.
* Coordinate all wiring & conduit with the electrical contractor.
* Door contacts monitor the position of the doors and reports status to the security system.
* Mode of Operation: When the correct credential is presented to the card reader the electric strike will release and allow entry.

Set: 18.0

Doors: 102A

Description: Interior - Pair - Classroom Set / No Closer

8	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Flush Bolt	2805 / 2905 (type as applicable)	US26D	RO
1	Classroom Lock	MB1A-3-03-15 x SFIC Premium Keyway	626	MB
2	Kick Plate	K1050 8" x 1" LDW BE CSK	US32D	RO
2	Wall Stop	400	US26D	RO
1	Astragal	357SP		PE
2	Silencer	608		RO

Notes: * Install astragal on pull side of active leaf.

Set: 19.0

Doors: 116-2
Description: Interior - Classroom Set / Wide Door

4	Hinge (heavy weight)	T4A3786 5" x 4-1/2"	US26D	MK
1	Classroom Lock	MB1A-3-03-15 x SFIC Premium Keyway	626	MB
1	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
1	Kick Plate	K1050 8" x 2" LDW BE CSK	US32D	RO
2	Wall Stop	400	US26D	RO
2	Silencer	608		RO

Set: 20.0

Doors: 106
Description: Interior - Pair - Classroom Set

8	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Flush Bolt	2805 / 2905 (type as applicable)	US26D	RO
1	Classroom Lock	MB1A-3-03-15 x SFIC Premium Keyway	626	MB
2	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
2	Kick Plate	K1050 8" x 1" LDW BE CSK	US32D	RO
2	Wall Stop	400	US26D	RO
1	Astragal	357SP		PE
2	Silencer	608		RO

Notes: * Install astragal on pull side of active leaf.

Set: 21.0

Doors: 113B, 114A
Description: Interior - Office Set

4	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Office Lock	MB1A-3-01-15 x SFIC Premium Keyway	626	MB
1	Wall Stop	400	US26D	RO
3	Silencer	608		RO

Set: 22.0

Doors: 102B-1, 103A

Description: Interior - Aluminum - Push/Pull w.deadbolt

1	Pivot Set	147	626	RF
1	Pivot	M19	626	RF
1	Mortise Deadlock	MS1850SN-050 x thumbturn	628	AD
1	Cylinder (mortise)	MBS-ICM x Verify Cam x SFIC Premium Keyway	626	MB
1	Push/Pull Set	RM2120-60 x Back-to-Back Mount	US32D	RO
1	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
1	Wall Stop	400	US26D	RO

Set: 23.0

Doors: 102B-2

Description: Interior - Wall System / Push Bar Panic Only

2	Push Bar Panic Device	PL100F	US32D	PL
2	Cylinder (mortise)	MBS-ICM x Verify Cam x SFIC Premium Keyway	626	BE

Notes: * Balance of Hardware by Wall System Manufacturer.

Set: 24.0

Doors: 103A, 113A

Description: Interior - Single - Double Acting

2	Push Plate	70E	US32D	RO
1	Concealed Closer	M608 w/608011 bottom pivot	626	RF
2	Kick Plate	K1050 8" x 2" LDW BE CSK	US32D	RO
1	Wall Stop	400	US26D	RO

Set: 25.0

Doors: 105-1, 105-2

Description: Interior - Pair - Double Acting

2	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Cylindrical Deadlock	MBT-K x SFIC Premium Keyway	626	MB
4	Push Plate	70E	US32D	RO
2	Concealed Closer	M608 w/608011 bottom pivot	626	RF
4	Armor Plate	K1050 34" x 1" LDW BE CSK	US32D	RO
4	Wall Stop	400	US26D	RO

Set: 26.0

Doors: 118-1, 118-2
Description: Interior - Exit Device

4	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Exit Device	Q1100 x Q309R-D x SFIC Premium Keyway	626	MB
1	Door Closer	QDC-40 PA / REG (arm type as applicable)	AL	LC
1	Wall Stop	400	US26D	RO
3	Silencer	608		RO

Set: 27.0

Doors: 113, 114-2
Description: Cylinder Only

1	Cylinder (mortise)	MBS-ICM x Verify Cam x SFIC Premium Keyway	626	MB

Notes: * Confirm cylinder type needed with door manufacturer.
* Balance of hardware by door manufacturer.

Set: 28.0

Doors: 116-3
Description: Padlock Only

1	Padlock	Z4S1 x SFIC Premium Keyway		MC

END OF SECTION 087100

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Doors.
2. Glazed curtain walls.
3. Glazed entrances.
4. Interior borrowed lites and sidelites.
5. Storefront framing.
6. Transparent mirror glass.

B. Related Sections include the following:

1. Division 8 Section "Mirrors."

1.3 DEFINITIONS

A. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air.

B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

C. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning 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.

D. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

    a. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

        1) Basic Wind Speed: 90 mph 3 second gust; 75 mph fastest mile wind speed.
        2) Importance Factor: II
        3) Exposure Category: C.

    b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

        1) Load Duration: 60 seconds or less

    c. Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow action.

        1) Load Duration: 30 days.

    d. Minimum Glass Thickness for Exterior Lites: Not less than 1/4-inch, except as otherwise indicated.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For glazing sealants used inside of the weatherproofing system, including printed statement of VOC content.

2. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

C. Samples: For the following products, in the form of 12-inch- square Samples:

1. Insulating glass for each designation indicated.

D. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

E. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

F. Maintenance Data: For plastic glazing sheet materials to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations for Clear Glass: Obtain clear float glass from one primary-glass manufacturer.

C. Source Limitations for Laminated Glass: Obtain laminated-glass units from one manufacturer using the same type of glass lites and interlayers for each type of unit indicated.

D. Source Limitations for Insulating Glass: Obtain insulating-glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.

E. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

F. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide".
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
3. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines," and SIGMA TB-3001, "Sloped Glazing Guidelines".

H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following inspecting and testing agency:

1. Insulating Glass Certification Council.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Maintain protective coverings on decorative plastic glazing sheets to avoid exposures to abrasive substances, excessive heat, and other sources of possible deterioration.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.9 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Special Warranty on Laminated Glass: Written warranty, made out to Owner and signed by laminated-glass manufacturer agreeing to furnish replacements for laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

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

C. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion, except as indicated.
2. Warranty Period for Insulating Glass in Wood Window Units: Refer to Division 8 Section “Wood Windows.”

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND FABRICATORS

A. In other Part 2 Articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
2. Product: Subject to compliance with requirements, provide the product specified or an equivalent product by one of the manufacturers specified for that type of product.

B. Manufacturers of Glass:

1. AFG Industries, Inc.
2. Cardinal Glass Industries, Inc.
3. Guardian Industries Corp.
4. Pilkington Building Products, NA.
5. PPG Industries, Inc.
6. Visteon Corp.

C. Manufacturers of Silicone Glazing Sealant:

1. Bostik Findley, Inc.
2. Dow Corning Corp.
3. GE Silicones.
4. Pecora Corp.
5. Sonneborn Building Products Division, ChemRex, Inc.
6. Tremco.

D. Fabricators of Insulating Glass Units:

1. ACI Distribution.
2. AFGD, Inc.
3. Arch Aluminum and Glass Co.
4. Guardian Industries Corp.
5. Interpane Glass Company.
6. Oldcastle Glass Group.
7. Viracon, Inc.

E. Translucent Glazing Unit Manufacturers

1. Advanced Glazings Limited
2. US Daylighting.

F. Transparent Mirror Glass

1. Pilkington MIrropane or approved equal

2.2 PRIMARY FLOAT GLASS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedules at the end of Part 3.

2.3 HEAT-TREATED FLOAT GLASS

A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); class, kind, and condition as indicated in schedules at the end of Part 3.

2.4 COATED FLOAT GLASS

A. General: Provide coated glass complying with requirements indicated in this Article and in schedules at the end of Part 3.

1. Provide Kind HS (heat-strengthened) coated float glass, except provide Kind FT (fully tempered) products where coated safety glass is indicated.

B. Sputter-Coated Float Glass: Float glass with metallic-oxide or metallic-nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), complying with requirements specified in schedules at the end of Part 3.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.

B. Overall Unit Thickness and Thickness of Each Lite: As indicated in the schedules at the end of Part 3.

C. Sealing System: Dual seal, with primary and secondary sealants as follows:

1. Manufacturer's standard sealants.

D. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:

1. Aluminum with black color-anodized finish.
2. Desiccant: Molecular sieve or silica gel, or blend of both.
3. Corner Construction: Manufacturer's standard corner construction.

2.6 TRANSLUCENT GLAZING UNITS (TGU)

A. Translucent Glazing Units: Provide factory-fabricated dual-sealed glass-clad panels with sheets of glass sealed at edges

1. The Translucent Glazing Unit shall be of a design such as to present a monolithic glass section without visible internal framing, support or other solid member inside of the perimeter spacer. The ability to use of any type or manufacture of architectural flat glass shall enable the visual integration of translucent surfaces with those of nearby vision glass as well as ensuring that the appearance of the translucent glazing surfaces does not deteriorate over the life of the building. The employment of separate technologies for thermal insulation and light diffusion shall be such as to ensure that different thermal insulation specifications do not affect light transmission.

2. For properties of individual glass lites making up glass-clad panels, refer to requirements specified elsewhere in this Section applicable to type, class, kind, and condition of glass products comprising lites of glass-clad panels.

B. Air Space: Provide minimum 1 inch (25 mm) air space as specified and scheduled, and as indicated on the Drawings. Fill air space with the following:

1. Aerogel: Provide hydrophobic aerogel produced as particles. Each particle shall consist largely of air (~95 percent) contained in nano-sized pores that severely inhibit heat transfer through the material. Particles can be contained in various ways to facilitate incorporation into a wide range of systems. Aerogel shall be recyclable, reusable, safe for human and ecological systems, and shall be created through a closed loop process with little to no impact on the environment.

a. Characteristics:

1) Thermal Conductivity: 9 mW/mK to 12 mW/mK.
2) Porosity: 95 percent air, 5 percent solid.
3) Pores: 20 to 40 nanometers.
4) Surface Area: ~750 m2/g.
5) Tap Density: 30 kg/m3 to 100 kg/m3.
6) Oil Absorption Capacity (DBP): 540 g/100 g.
7) Specific Heat Capacity: Kj/Kg 0.7 to 1.15.
8) Particle Sizes: 5 microns to 4 mm.
9) Surface Chemistry: Completely hydrophobic.
10) Opacity: Translucent, IR opacified and opaque.

C. Description:

1. Air filled preassembled units consisting of:

a. Two lites of glass.
b. Proprietary honeycomb transparent insulation core aligned perpendicular to glazing, for TGU thermal insulation.
c. Translucent veils attached to both sides of honeycomb cell core adjacent to glass surfaces.
d. Continuous perimeter metal spacer bar separated from glass surfaces with foam tape.
e. Glass lites connected together with spacer bar using structural silicone sealant.
f. Airspace within TGU filled with air pressure equalized to atmospheric pressure with stainless steel capillary pressure equalization (vent) tube located at top right corner of TGU, positioned with tube opening pointing downward (as viewed from building interior).

2.7 TRANSPARENT MIRROR GLASS

A. Vision Area Coating Quality Specifications The reflective coating shall meet the performance specifications as published. Coating quality will meet ASTM C 1376. A light level ratio of at least 8:1 from bright (subject) side to dark (observer) side shall be maintained for effective operation.

B. Basis of Design Product:Pilkington **Mirropane T.M.TM**

1. Performance Data

a.	Glazing	
b.	Nominal Glass Thickness:	1/4 in.
c.	GlassSubstrate:	Grey
d.	Visible Transmittance:	11%
e.	Visible Reflectance On The Coated Side:	71%
f.	Recommended Light Ratio:	8:1
g.	Subject-side:Observer-side:	Mirror coating toward subject-side

2.8 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

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

B. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied, chemically curing sealant in the Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

C. Low-Modulus Nonacid-Curing Silicone Glazing Sealant: Dow Corning Corp., 790 Silicone Building Sealant or equivalent product by another specified manufacturer.

1. Application: Non-structural glazing.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Additional Movement Capability: 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.
5. Use Related to Exposure: NT (nontraffic).

6. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.

    a. Use O Glazing Substrates: Aluminum coated with a high-performance coating, galvanized steel, and wood.

2.9 GLAZING GASKETS

A. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:

1. Neoprene.
2. EPDM.
3. Silicone.
4. Thermoplastic polyolefin rubber.
5. Any material indicated above.

2.10 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

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.

2.11 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing for glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 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. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance 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. 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. Install gaskets so they protrude past face of glazing stops.

3.5 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 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.

3.6 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass and from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended in writing by product manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by the product manufacturer.

3.7 GLASS SCHEDULE – Refer to Drawings / Final Schedule to be issued prior to this Friday.

END OF SECTION 088000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Silvered mirrored glass.

B. Related Sections include the following:

1. Division 8 Section "Glazing" for glass with reflective coatings used for vision and spandrel lites.
2. Division 10 Section "Toilet Accessories" for metal-framed mirrors.

1.3 DEFINITIONS

A. Deterioration of Silvered Mirrored Glass: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning silvered mirrored glass contrary to mirrored glass manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1.4 PERFORMANCE REQUIREMENTS

A. Provide mirrored glass that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Silvered mirrored glass. Include description of materials and process used to produce mirrored glass that indicates source of glass, glass coating components, edge sealer, and quality-control provisions.
2. Mirror mastic.
3. Mirror hardware.

B. Shop Drawings: Include elevations, sections, details, and attachments to other Work.

C. Samples for Verification: For the following products, in sizes indicated below:

1. Mirrored glass, 12 inches square, including edge treatment on 2 adjoining edges.
2. Mirror clips.
3. Mirror trim, 12 inches long.

D. Product Certificates: Signed by manufacturers of mirrored glass and mirror mastic certifying that products furnished comply with requirements.

E. Mirror Mastic Glass Coating Compatibility Test Reports: From an organic protective coating manufacturer indicating that mirror mastic has been tested for compatibility and adhesion with organic protective coating applied to silvered mirrored glass. Include organic coating manufacturers'

interpretation of test results relative to performance and recommendations for use of mastics with organic protective coating.

F. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed mirrored glass installations similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations for Mirrored Glass: Obtain mirrored glass from one source for each type of mirrored glass indicated.

C. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each type of accessory indicated.

D. Glazing Publications: Comply with published recommendations in GANA's "Glazing Manual," unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.

E. NAAMM's Publication: For silvered mirrored glass, comply with recommendations in NAAMM's "Mirrors, Handle with Extreme Care, Tips for the Professional on the Care and Handling of Mirrors."

F. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to mirrored glass manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For silvered mirrored glass, comply with mirrored glass manufacturer's written instructions for shipping, storing, and handling mirrored glass as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

1.8 PROJECT CONDITIONS

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

1.9 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Special Warranty for Silvered Mirrored Glass: Written warranty, made out to Owner and signed by mirrored glass manufacturer agreeing to replace silvered mirrored glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below:

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Mirror Company, Inc.
2. Arch Aluminum & Glass Co.
3. Carolina Mirror Company.
4. Gardner Glass Products.
5. Lenoir Mirror Company.
6. Walker Glass Co., Ltd.

2.2 FLOAT GLASS

A. Tempered Float Glass: ASTM C 1048, Type I (transparent glass, flat), Condition A (uncoated), Kind FT (fully tempered), Quality q3 (glazing select) float glass, complying with the following requirements:

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of mirror as installed, unless otherwise indicated.
2. Clear Tempered Float Glass: Class 1 (clear).

a. Thickness: 6 mm.

2.3 MIRRORED GLASS

A. Silvered Mirrored Glass: Tempered, clear float glass with successive layers of chemically deposited silver, electrically or chemically deposited copper, and manufacturer's standard organic protective coating applied to second glass surface to produce a coating system complying with FS DD-M-411.

2.4 FABRICATION

A. Mirrored Glass Sizes: Cut mirrored glass to final sizes and shapes to suit Project conditions.

B. Cutouts: Fabricate cutouts for notches and holes in mirrored glass without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrored glass.

C. Mirrored Glass Edge Treatment: Treat edges as indicated below.

1. Rounded polished edge.
2. Require mirrored glass manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

2.5 MISCELLANEOUS MATERIALS

A. Setting Blocks: Neoprene, 70 to 90 Shore A hardness.

B. Edge Sealer: Coating compatible with glass coating and approved by mirrored glass manufacturer for use in protecting against silver deterioration at mirrored glass edges.

C. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrored glass by spot application, certified by both mirrored glass manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrored glass will be installed.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Gunther Mirror Mastics.
b. Palmer Products Corporation.

D. Extruded-Aluminum Top and Bottom Trim: J-channels formed with a return deep enough to produce a glazing channel to accommodate mirrored glass units of thickness indicated and in lengths required to cover bottom edge of each mirrored glass unit in a single piece.

1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.
2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.04 inch.
3. Products: Subject to compliance with requirements, provide one of the following:

a. Bottom Trim:
1) CRL Standard "J" Channel; C. R. Laurence Co., Inc.

b. Top Trim:
1) CRL Deep "J" Channel; C. R. Laurence Co., Inc.

E. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

F. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrored glass units are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance.

1. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
2. Proceed with mirrored glass installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

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

3.3 GLAZING

A. General: Install mirrored glass units to comply with written instructions of mirrored glass manufacturer and with referenced GANA and NAAMM publications. Mount mirrored glass accurately in place in a manner that avoids distorting reflected images.

B. Provide space for air circulation between back of mirrored glass units and face of mounting surface.

C. Mastic Spot Installation System: Install mirrored glass units with mastic as follows:

1. Apply barrier coat to mirrored glass backing where approved in writing by manufacturers of mirrored glass and backing material.
2. Apply mastic in spots to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrored glass units and face of mounting surface.
3. After mastic is applied, align mirrored glass units and press into place while maintaining a minimum air space of 1/8 inch between back of mirrored glass and mounting surface.

D. For wall-mounted mirrored glass units, install permanent means of support at bottom and top edges with bottom support designed to withstand mirrored glass weight and top support designed to prevent mirrored glass from coming away from wall along top edges.

1. 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 mirrored glass units.
2. For continuous bottom supports, provide setting blocks 1/8 inch thick by 4 inches long at quarter points. For channels or other continuous supports in which water could be trapped, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long.
3. For metal or plastic clips, place a felt or plastic pad between mirrored glass and each clip to prevent spalling of mirrored glass edges.
4. Where indicated, install bottom and top trim. Fabricate trim in single lengths to fit and cover top and bottom edges of mirrored glass units.

3.4 PROTECTION AND CLEANING

A. Protect mirrored glass from breakage and contaminating substances resulting from construction operations.

1. Do not permit edges of silvered mirrored glass to be exposed to standing water.
2. Maintain environmental conditions that will prevent silvered mirrored glass from being exposed to moisture from condensation or other sources for continuous periods of time.

B. Wash mirrored glass not more than four days before date scheduled for inspections intended to establish date for Substantial Completion. Wash mirrored glass by methods recommended in NAAMM publication and in writing by mirrored glass manufacturer. Use water and glass cleaners free from substances capable of damaging mirrored glass edges or coatings.

END OF SECTION 088300

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes non-load-bearing steel framing members for the following applications:

1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. Sound Transmission Characteristics: For STC-rated assemblies that incorporate non-load-bearing steel framing, 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Framing and Furring:

a. Clark Dietrich Steel Framing, Inc.
b. Consolidated Systems, Inc.
c. MarinoWARE.
d. MBA.
e. Nuconsteel; a Nucor Company.
f. National Gypsum Co.; Gold Bond Building Products Division
g. Unimast, Inc.
h. SCAFCO Corporation.
i. Steel Network, Inc. (The).
j. Telling Industries, LLC.
k. United Steel Manufacturing.

2.2 NON-LOAD-BEARING STEEL FRAMING, GENERAL

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: Manufacturer's standard corrosion-resistant zinc coating .

2.3 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to five (5) times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

a. Type: Post-installed chemical anchor or post-installed expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to ten (10) times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.

1. Depth: Not less than 2 inches.

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
2. Steel Studs: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.0346 inch.
b. Depth: As indicated on Drawings.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

a. Minimum Base Metal Thickness: 0.0346 inch .

4. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.

a. Configuration: Asymmetrical or hat shaped.

F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation; 640-C Fire Front 650-C Drywall Furring System.
c. USG Corporation; Drywall Suspension System.

2.4 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Studs and Runners: ASTM C 645.

1. Steel Studs and Runners:

    a. Minimum Base-Metal Thickness: 0.033 inch, 20 gauge**.**
    b. Depth: As indicated on Drawings.

2. Embossed Steel Studs and Runners:

    a. Minimum Base-Metal Thickness: 0.022 mils, EQ 20 gauge (up to 14 foot height requirement) or 0.030 mils, EQ 20 gauge (above 14 foot height requirement).
    b. Depth: As indicated on Drawings.

B. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.

    a. Bridging: Strap or 1-1/2 inch cold-rolled channel.

2. Deflection Track: Steel sheet top runner 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. Products: Subject to compliance with requirements, provide one of the following:

        1) Steel Network Inc. (The); VertiClip SLD Series.
        2) Superior Metal Trim; Superior Flex Track System (SFT).

C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the 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. Products: Subject to compliance with requirements, provide one of the following:

    a. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
    b. Metal-Lite, Inc.; The System.

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

1. Minimum Base-Metal Thickness: 0.0312 inch .

E. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel 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: 0.0312 inch.
2. Depth: 7/8 inch.

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: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: 3/4 inch.
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch.
3. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

2.5 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. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: 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

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

1. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
2. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

3.2 INSTALLING SUSPENSION SYSTEMS

A. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

B. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Do not attach hangers to steel roof deck except as specifically approved by structural engineer.
4. Do not connect or suspend steel framing from ducts, pipes, or conduit.

C. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8-inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.3 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

1. Space studs as follows:

a. Single-Layer Application: 16 inches o.c., unless otherwise indicated.
b. Multilayer Application: 16 inches o.c., unless otherwise indicated.
c. Tile Backing Panels: 16 inches o.c., unless otherwise indicated.

C. Install tracks (runners) 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 penetrating 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 doorframes; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install two studs at each jamb, unless otherwise indicated.
b. 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.

D. Direct Furring:

1. 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 varies not more than 1/8-inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.
2. Tile backing panels.

B. See Division 9 Section “Non-Load-Bearing Steel Framing” for framing systems for support of gypsum board.

1.3 SUBMITTALS

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

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

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.

PART 2 - PRODUCTS

2.1 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36 or ASTM C 1396, as applicable to type of gypsum board indicated.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Gypsum Co.
2. G-P Gypsum.
3. Lafarge North America Inc.
4. National Gypsum Company.
5. USG Corporation.

C. Regular Type:

1. Thickness: 5/8 inch minimum thickness, unless otherwise indicated.
2. Long Edges: Tapered.

D. Type X:

1. Thickness: 5/8 inch minimum thickness, unless otherwise indicated.
2. Long Edges: Tapered.

E. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

1. Thickness: 1/2-inch.
2. Long Edges: Tapered.
3. Application: Ceilings and bulkheads.

2.2 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide one of the following:

a. C-Cure; C-Cure Board 990.
b. CertainTeed Corp.; FiberCement BackerBoard.
c. National Gypsum Company, Permabase Cement Board.
d. USG Corporation; DUROCK Cement Board.

2. Thickness: 5/8 inch.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. Expansion (control) joint.
f. Curved-Edge Cornerbead: With notched or flexible flanges.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: 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 compound or drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

D. Joint Compound for Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. 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.

E. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."

F. Thermal Insulation: As specified in Division 7 Section "Thermal Insulation."

G. Vapor Retarder: As specified in Division 7 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4 to 3/8-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.

D. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of

partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

E. Joints in multiple layer assemblies to be offset a minimum of 12 inches. Joints in all layers to be filled.

3.2 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Regular Type: Where indicated on Drawings.
2. Type X: Where indicated on Drawings
3. Ceiling Type: Ceiling and bulkhead surfaces.
4. Moisture-Resistant Type: Vertical surfaces in restrooms, janitor's closets, entrance vestibules, high humidity areas, and within 48 inches of drinking fountains/water coolers.

3.3 APPLYING TILE BACKING PANELS

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

3.4 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 manufacturers written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. Bullnose Bead: Use at outside corners only where specifically indicated.
3. LC-Bead: Use at exposed panel edges, unless otherwise indicated.
4. L-Bead: Use where indicated.
5. Curved-Edge Cornerbead: Use at curved openings.

3.5 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 those with trim having flanges not intended for 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, such as attics and inside shafts, etc., unless a higher level of finish is required for fire-sensitive and sound-rated assemblies, and where indicated.
2. Level 2: Panels that are substrate for tile .

3. Level 3: Panels that are substrate for medium or heavy texture prior to painting and for heavy grade wallcoverings.
4. Level 4: At panel surfaces that will be exposed to view, and are substrate for flat paint, eggshell paint, and lightweight wallcoverings.

    a. Primer and its application to surfaces are specified in other Division 9 Sections.

5. Level 5: Panels that are substrate for semi-gloss paint, gloss paint and un-backed wallcoverings, on wall surfaces over 12-feet high, at special lighting conditions, at all dark-colored paint, and on corridor and curved wall surfaces.

    a. Primer and its application to surfaces are specified in other Division 9 Sections.

3.6 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or 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 092900

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Ceramic tile.
2. Waterproof membrane.
3. Crack isolation membrane.
4. Tile backing panels.
5. Metal edge strips.

B. Related Sections:
1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Section 092400 "Portland Cement Plastering" for portland cement scratch coat over metal lath on wall surfaces.
3. Section 092613 "Gypsum Veneer Plastering" for cementitious backer units.
4. Section 092900 "Gypsum Board" for glass-mat, water-resistant backer board.
5. Section 093033 "Stone Tiling."
6. Section 096340 "Stone Flooring" for stone thresholds.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.
2. Step Treads: Minimum 0.6.
3. Ramp Surfaces: Minimum 0.8.

1.5 ACTION SUBMITTALS

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

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
3. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

C. Product Certificates: For each type of product, signed by product manufacturer.

D. Material Test Reports: For each tile-setting and -grouting product.

1.7 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 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.

1.8 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer, if possible.

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 one manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:

1. Waterproof membrane.
2. Crack isolation membrane.
3. Joint sealants.
4. Cementitious backer units.

5. Metal edge strips.

D. 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. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.9 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.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.10 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.

D. Low-Emitting Materials: Tile flooring systems shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. 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.

F. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

G. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. Provide manufacturers products indicated on Drawings, no substitutions.

2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes. All thresholds to be zinc metal strip, 1/8 inch face width.

2.4 TILE BACKING PANELS

1. See Division 9 Section “Gypsum Board” for tile backer boards.

2.5 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, selected from the following, 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. Products: Subject to compliance with requirements, provide one of the following:

a. Boiardi Products; a QEP company; Elastiment 344 Reinforced Waterproofing and Anti-Fracture/Crack Suppression Membrane.
b. Bonsal American; an Oldcastle company; B 6000 Waterproof Membrane with Glass Fabric.
c. Bostik, Inc.; Hydroment Blacktop 90210.
d. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
e. MAPEI Corporation; Mapelastic L (PRP M19).

C. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Boiardi Products; a QEP company; Elastiment 644 Membrane Waterproofing System.
b. Bonsal American; an Oldcastle company; B 6000 Waterproof Membrane.
c. Bostik, Inc.; Durabond D-222 Duraguard Membrane.
d. Laticrete International, Inc.; Latapoxy 24hr HydroProofing.

e. MAPEI Corporation; Mapelastic HPG.

D. Latex-Portland Cement: Flexible mortar consisting of cement-based mix and latex additive.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Boiardi Products; a QEP company; Elastiment 323 Cement Based Waterproofing, Anti-Fracture/Crack Suppression Membrane.
b. MAPEI Corporation; Mapelastic (PRP 315).
c. Southern Grouts & Mortars, Inc.; Southcrete 1100.

2.6 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Noble Company (The); Nobleseal CIS.

C. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Schluter Systems L.P.; KERDI.

D. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and fabric reinforcement.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Boiardi Products; a QEP company; Elastiment 344 Reinforced Waterproofing and Anti-Fracture/Crack Suppression Membrane.
b. Bonsal American; an Oldcastle company; B 6000 Waterproof Membrane with Glass Fabric.
c. Bostik, Inc.; Hydroment Blacktop 90210.
d. Laticrete International, Inc.; Laticrete Blue 92 Anti-Fracture Membrane.
e. MAPEI Corporation; Mapelastic L (PRP M19).

E. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Bostik, Inc.; Durabond D-222 Duraguard Membrane.
b. C-Cure; CureLastic 949.
c. Jamo Inc.; Waterproof.
d. Mer-Kote Products, Inc.; Fracture-Guard 5000.
e. Southern Grouts & Mortars, Inc.; Southcrete 1100 Crack Suppression and Waterproofing.

2.7 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Boiardi Products; a QEP company.
b. Bonsal American; an Oldcastle company.
c. Bostik, Inc.
d. Laticrete International, Inc.
e. MAPEI Corporation.
f. Summitville Tiles, 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.

2.8 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.

B. Standard Cement Grout: ANSI A118.6.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bonsal American; an Oldcastle company.
b. Bostik, Inc.
c. C-Cure.
d. Custom Building Products.
e. DAP, Inc.
f. Laticrete International, Inc.
g. MAPEI Corporation.
h. Southern Grouts & Mortars, Inc.
i. Summitville Tiles, Inc.

2.9 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."

1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

2.10 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. 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.

C. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.11 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set 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 (1:50) 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.

3.3 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANE INSTALLATION

A. Install waterproofing and crack-suppression membrane on floors to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate. Install up walls 6”minimum.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.4 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA 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 TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. 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.

E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. All Floor and Wall Tile: 1/16 inch (1.6 mm).

F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

G. 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.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.5 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 093000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings.

B. Related Sections include the following:

1. Division 7 Section “Joint Sealants” for acoustical sealant.

C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

C. Samples for Initial Selection: For components with factory-applied color finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: 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.

E. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Size and location of initial access modules for acoustical panels.
4. Items penetrating finished ceiling including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.

5. Perimeter moldings.

F. Qualification Data: For testing agency.

G. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.

H. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

I. Field quality-control reports.

J. Maintenance Data: For finishes to include in maintenance manuals.

K. 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 Panels: 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. Hold-Down Clips: Equal to 2 percent of quantity installed.
4. Impact Clips: Equal to 2 percent of quantity installed.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

B. 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 typical ceiling area 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: The products specified herein or as scheduled on the drawings are the Basis of Design Product. Subject to compliance with requirements, provide the Basis of Design Product. Products and manufacturer's not listed herein will be considered by the Architect for approval, written request for approval must be made and approved a minimum of ten days prior to the project bid. Failure to provide substitution requests will result in rejection. Comply with:

1. Substitutions: Division 1 Section "Product Requirements" for Comparable Products Form.

2. Submit the following with the substitution request.

a. Detailed specifications of construction and fabrication.
b. Independent certified test reports indicating compliance with design and performance requirements specified in this section.
c. Sample of each type of fitting and fastener.

B. Acceptable Manufacturer's

1. As indicated on Drawings.

2.2 ACOUSTICAL PANELS, GENERAL

A. Recycled Content: Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 10 percent by weight.

B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

D. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.3 ACOUSTICAL PANELS

A. See Finish Schedule on Drawings.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, 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 per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

a. Type: Postinstalled expansion anchors.

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 per ASTM E 1190, conducted by a qualified testing and inspecting agency.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch-diameter wire.

2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILINGS

A. Metal suspension system shall be manufactured by the same manufacturer of the ceiling tile and as indicated on the Drawings in the finish schedule .

B. Products: Subject to compliance with requirements, provide products by one of the following:

1. As indicated on Drawings, match to ceiling panel manufacturer.

C. Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 15/16-inch- wide metal caps on flanges.

1. Structural Classification: ASTM C 635 Intermediate-duty system.
2. End Condition of Cross Runners: Override (stepped) or butt-edge type.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and

other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers 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 either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Do not attach hangers to steel deck tabs.
8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
9. 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.
10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels in a basket-weave pattern.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

1.1 GENERAL

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient stair accessories.
3. Resilient molding accessories.

1.4 SUBMITTALS

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

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: 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.

D. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT PRODUCTS

A. Products: Basis of design products are as indicated on plans or subject to compliance with requirements and with architects prior approval, provided the product as indicated in the Finish Schedule or an equal product manufactured by one of the following:

1. Johnsonite.
2. Roppe Corporation, USA.

2.2 RESILIENT BASE

A. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: As indicated on the Drawing.

B. Minimum Thickness: 0.125 inch.

C. Height: As indicated on Drawings.

D. Lengths: Coils in manufacturer's standard length.

E. Outside Corners: Job formed.

F. Inside Corners: Job formed.

G. Finish: As selected by Architect from manufacturer's full range.

H. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 RESILIENT STAIR ACCESSORIES

A. Resilient Stair Treads Standard: ASTM F 2169.

1. Material Requirement: Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic).
2. Surface Design: As scheduled on the Drawings.

B. Thickness: 1/4 inch and tapered to back edge.

C. Size: Lengths and depths to fit each stair tread in one piece or, for treads exceeding maximum lengths manufactured, in equal-length units.

D. Risers: Smooth, flat, toeless, height and length to cover risers; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

1. Thickness: 0.125 inch.

E. Stringers: Of same thickness as risers, height and length after cutting to fit risers and treads and to cover stair stringers; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

F. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 RESILIENT MOLDING ACCESSORY

A. Description: Reducer strip for resilient floor covering.

1. Manufacturer: Same manufacturer as resilient wall base.
2. Material: Rubber.
3. Profile and Dimensions: As indicated.
4. Color: Match resilient wall base.

B. Adhesive: As recommended by the reducer strip manufacturer.

1. Contractor shall not use carpet or VCT adhesive for securing reducer strips, unless approved by the manufacturer.
2. Adhesive is not required for quarter round mouldings.

2.5 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. VCT and Asphalt Tile Adhesives: Not more than 50 g/L.
b. Rubber Floor Adhesives: Not more than 60 g/L.

C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Treads and 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 and as follows. Proceed with installation only after substrates pass testing.

    a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

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

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required, unless indicated otherwise.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.

H. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 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.
3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

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 that would otherwise be exposed.

3.5 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 surfaces thoroughly.
3. Damp-mop 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.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.

1. Apply two coat(s).

E. Cover resilient products until Substantial Completion.

END OF SECTION 096513

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes: Linoleum sheet flooring.

B. Related Sections:

1. Division 9 Section "Resilient Wall Base and Accessories" for resilient base, reducer strips, and other accessories installed with linoleum floor covering.

1.3 SUBMITTALS

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

B. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

C. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch sections of each color and pattern of floor covering required.

1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

D. Heat-Welded Seam Samples: For each floor covering product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to rigid backing and prepared by Installer for this Project.

E. Qualification Data: For qualified Installer.

F. Maintenance Data: For each type of floor covering to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 65 deg F or more than 90 deg F.

1. Sheet Flooring: Store rolls upright.

1.6 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor coverings during the following time periods:

1. 72 hours before installation.
2. During installation.
3. 72 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 72 hours after floor covering installation.

E. Install floor coverings after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 LINOLEUM FLOOR COVERING, GENERAL

A. Products: The products specified herein or as scheduled on the drawings are the Basis of Design Product. Subject to compliance with requirements, provide the Basis of Design Product. Products and manufacturer's not listed herein will be considered by the Architect for approval, written request for approval must be made and approved a minimum of ten days prior to the project bid. Comply with:

1. Substitutions: Division 1 Section "Product Requirements" for Comparable Products Form.

2. Submit the following with the substitution request.

a. Detailed specifications of construction and fabrication.
b. Independent certified test reports indicating compliance with design and performance requirements specified in this section.
c. Sample of each type of fitting and fastener.

B. Sheet Flooring: ASTM F 2034, Type I, linoleum sheet with backing.

1. Manufacturer: Refer to finish schedule on drawings, or approved acceptable equal.
2. Roll Size: In manufacturer's standard length by not less than 78 inches wide.
3. Thickness: 0.10 inch or greater.
4. Colors and Patterns: As scheduled on the Drawings.

C. Seaming Method: Heat welded.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit products and substrate conditions indicated.

C. Heat-Welding Bead: Solid-strand product of linoleum floor covering manufacturer.

1. Match linoleum floor covering.

D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
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 floor coverings until they are same temperature as space where they are to be installed.

1. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.3 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions for installing floor coverings.

B. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

C. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

D. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on subfloor. Use chalk or other nonpermanent marking device.

3.4 LINOLEUM SHEET FLOORING INSTALLATION

A. Unroll sheet floorings and allow them to stabilize before cutting and fitting.

B. Lay out sheet floorings as follows:

1. Maintain uniformity of floor covering direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.
3. Match edges of floor coverings for color shading at seams.
4. Avoid cross seams.
5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).

C. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

D. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.

B. Perform the following operations immediately after completing floor covering installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor coverings before applying liquid floor polish.

1. Apply two coats.

E. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover floor coverings until Substantial Completion.

END OF SECTION 096516

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Vinyl composition floor tile (VCT).

B. Related Sections:

1. Division 9 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.

1.3 SUBMITTALS

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

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

C. Samples for Initial Selection: For each type of floor tile indicated.

D. Samples for Verification: Full-size units of each color and pattern of floor tile required.

E. Product Schedule: For floor tile.

F. Qualification Data: For qualified Installer.

G. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.6 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION TILE PRODUCTS

A. Products: The products as scheduled on the drawings are the Basis of Design Product. Subject to compliance with requirements, provide the Basis of Design Product or an equal product by one of the listed manufacturer's. Products and manufacturer's not listed herein will be considered by the Architect for approval, written request for approval must be made and approved a minimum of ten days prior to the project bid. Failure to provide substitution requests will result in rejection. Comply with:

1. Substitutions: Division 1 Section "Product Requirements.

2. Submit the following with the substitution request.

a. Detailed specifications of construction and fabrication.
b. Independent certified test reports indicating compliance with design and performance requirements specified in this section.
c. Sample of each type of fitting and fastener.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Refer to Finish Schedule.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

    a. Vinyl Composition Floor Tile Adhesives: Not more than 50 g/L.
    b. Rubber Floor Tile Adhesives: Not more than 60 g/L.

C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

    a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

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

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis unless otherwise indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern) unless otherwise noted.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from vinyl composition tile floor surfaces before applying liquid floor polish.

1. Apply two coat(s).

E. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.

F. Cover floor tile until Substantial Completion.

END OF SECTION 096519

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. High-performance resinous flooring systems.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for concrete substrates to receive resinous flooring.
2. Division 7 Section "Joint Sealants" for joint-sealant materials and installation of sealant materials at joints in resinous flooring systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Samples for Initial Selection: For each type of exposed finish required.

C. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.

D. Product Schedule: For resinous flooring. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

B. Material Certificates: For each resinous flooring component, from manufacturer.

C. Material Test Reports: For each resinous flooring system.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer (applicator) who has specialized in installing resinous flooring similar in material, design, and extent to that indicated for this Project and who is acceptable to resinous flooring manufacturer.

1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to install resinous flooring systems specified.

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, and sealing or finish coats, through one source from a single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.

C. Field Samples: On floor area selected by Architect, provide full-thickness resinous flooring system samples that are at least 48 inches square to demonstrate texture, color, thickness, chemical resistance, cleanability, and other features of each resinous flooring system required. Simulate finished lighting conditions for review of in-place field samples.

1. If field samples are unacceptable, make adjustments to comply with requirements and apply additional samples until field samples are approved.
2. After field samples are approved, these surfaces will be used to evaluate resinous flooring.
3. Obtain Architect's approval of field samples before applying resinous flooring.
4. Final approval of colors will be from field samples, not samples submitted for verification.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring installation.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring installation.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Stonhard “StonShield HRI” or comparable product, as approved by the Architect, by one of the following:

1. BASF Construction Chemicals, Inc.; BASF Building Systems.
2. Dur-A-Flex, Inc.
3. Sherwin-Williams Company; General Polymers.

2.2 MATERIALS

A. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 RESINOUS FLOORING

A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, decorative-aggregate-filled, epoxy-resin-based, monolithic floor surfacing designed to produce a seamless floor and integral cove base.

B. System Characteristics:

1. Color and Pattern: As indicated on the finish schedule or as selected by Architect from manufacturer's full range.
2. Wearing Surface: As indicated on the Drawings.
3. Overall System Thickness: 3/16 inch.

C. Body Coats:

1. Resin: Epoxy.
2. Formulation Description: 100 percent solids.
3. Application Method: Troweled or screeded.
4. Aggregates: Colored quartz (ceramic-coated silica).

D. Topcoat: Sealing or finish coats.

1. Resin: Epoxy.
2. Formulation Description: 100 percent solids.
3. Type: Clear.
4. Finish: Gloss.
5. Number of Coats: As required for the appropriate slip resistance.

E. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 10000 psi per ASTM C 579.
2. Tensile Strength: 2000 psi per ASTM C 307.
3. Water Absorption: 0.01% per ASTM C 413.
4. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch permanent indentation per MIL-D-3134.
5. Abrasion Resistance: 0.06 gm maximum weight loss per ASTM D 4060.
6. Flammability: Self-extinguishing per ASTM D 635.
7. Hardness: 85, Shore D per ASTM D 2240.
8. Slip Resistance: Light texture between 0.6 and 0.8.

2.4 ACCESSORIES

A. Primer: Type recommended by manufacturer for substrate and body coats indicated.

1. Formulation Description: 100 percent solids.

B. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrate according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminates incompatible with resinous flooring.

1. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
2. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
3. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.

C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations.

3.2 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.

a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply reinforcing membrane to substrate cracks.

D. Apply self-leveling slurry body coat(s) in thickness indicated.

1. Broadcast aggregates and, after resin is cured, remove excess aggregates to provide surface texture indicated.

E. Apply troweled or screeded body coat(s) in thickness indicated. Hand or power trowel and grout to fill voids. When cured, sand to remove trowel marks and roughness.

F. Integral Cove Base: Apply cove base mix to wall surfaces at locations indicated. Round internal and external corners. Install cove base according to manufacturer's written instructions and details including taping, mixing, priming, troweling, sanding, and topcoating of cove base.

G. Apply sealing or finish coat(s), including grout coat, if any, of type recommended by resinous flooring manufacturer to produce finish indicated. Apply in number of coats and at spreading rates recommended in writing by manufacturer.

3.3 CLEANING AND PROTECTING

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

B. Clean resinous flooring not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each Project area. Use cleaning materials and procedures recommended in writing by resinous flooring manufacturer.

END OF SECTION 096723

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes modular carpet tile.

B. Related Sections include the following:

1. Division 9 Section "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. 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.
d. Review carpet pattern and grain direction.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.
11. Provide shop drawings and details that are project specific and indicate adjacent construction.

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. Qualification Data: For Installer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

G. Maintenance Data: For carpet 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.

H. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced Installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling."

1.7 PROJECT CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet 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 demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.8 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
3. Warranty Period: Ten (10) years from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than one complete box.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Products: The products as scheduled on the drawings are the Basis of Design Product. Subject to compliance with requirements, provide the Basis of Design Product.

2.2 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 complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. VOC Limits: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

C. Edge Guards: Rubber, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints. Reference Drawings for location and type.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," 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. 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.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, 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 104, Section 16, "Protection of 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 096813

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Access-flooring panels.
2. Understructure.

1.3 COORDINATION

A. Coordinate location of mechanical and electrical work in underfloor cavity to prevent interference with access-flooring pedestals.

B. Mark pedestal locations on subfloor using a grid to enable mechanical and electrical work to proceed without interfering with access-flooring pedestals.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review connection with mechanical and electrical systems.
2. Review requirements related to sealing the plenum.
3. Review procedures for keeping underfloor space clean.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include layout of access-flooring system and relationship to adjoining Work based on field-verified dimensions.

1. Details and sections with descriptive notes indicating materials, finishes, fasteners, typical and special edge conditions, accessories, and understructures.

C. Samples:

1. Exposed Metal Accessories: Approximately 10 inches in length.
2. One complete full-size floor panel, pedestal, and understructure unit for each type of access-flooring system required.

D. Samples for Verification: For the following products:

1. Exposed Metal Accessories: Approximately 10 inches in length.
2. One complete full-size floor panel, pedestal, and understructure unit for each type of access-flooring system required.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of access-flooring system.

C. Product Test Reports: For each type of flooring material and exposed finish, for tests performed by a qualified testing agency.

D. Seismic Design Calculations: For seismic design of access-flooring systems including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Preconstruction Test Reports: For preconstruction adhesive field test.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install access flooring until spaces are enclosed, subfloor has been sealed, ambient temperature is between 50 and 90 deg F, and relative humidity is not less than 20 and not more than 70 percent.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Access flooring shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Structural Performance: Provide access-flooring systems capable of complying with the following performance requirements according to testing procedures in CISCA's "Recommended Test Procedures for Access Floors":

1. Concentrated Loads: Minimum of 1000 lbf with the following deflection and permanent set:

    a. Top-Surface Deflection: 0.10 inch.
    b. Permanent Set: 0.010 inch.

2. Ultimate Loads: 1800 lbf.
3. Rolling Loads: With local or overall deformation not to exceed 0.040 inch.

    a. CISCA Wheel 1: 10 passes at 400 lbf.

4. Stringer Load Test: 225 lbf at center of span with a permanent set not to exceed 0.010 inch.
5. Pedestal Axial Load Test: 5000 lbf.
6. Pedestal Overturning Moment Test: 1000 lbf x inches.
7. Uniform Load Test: 200 lbf/sq. ft. with a maximum top-surface deflection not to exceed 0.040 inch and a permanent set not to exceed 0.010 inch.
8. Drop Impact Load Test: 75 lb.
9. Total System Height: 6-inches above sub-floor.

C. Fire Performance:

1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 25 or less.

b. Smoke-Developed Index: 50 or less.

2. Combustion Characteristics: ASTM E 136.

D. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 MANUFACTURERS

A. Source Limitations: Obtain access-flooring system from single source from single manufacturer.

2.3 FLOOR PANELS

A. Floor Panels, General: Provide modular panels interchangeable with other field panels without disturbing adjacent panels or understructure.

1. Size: Nominal 24 by 24 inches.
2. Attachment to Understructure: By gravity.

B. Cementitious-Core Steel Panels: Fabricated from cold-rolled steel sheet, with the die-cut flat top sheet and die-formed and stiffened bottom pan welded together, and with metal surfaces protected against corrosion by manufacturer's standard factory-applied finish. Fully grout internal spaces of completed units with manufacturer's standard cementitious fill.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Haworth, Inc.
b. Tate Access Floors, Inc.

2.4 UNDERSTRUCTURE

A. Pedestals: Assembly consisting of base, column with provisions for height adjustment, and head (cap); made of steel.

1. Provide pedestals designed for use in seismic applications.
2. Base: Square or circular base with not less than 16 sq. in. of bearing area.
3. Column: Of height required to bring finished floor to elevations indicated. Weld to base plate.
4. Provide vibration-proof leveling mechanism for making and holding fine adjustments in height over a range of not less than 2 inches and for locking at a selected height, so deliberate action is required to change height setting and prevent vibratory displacement.
5. Head: Designed to support the panel system indicated.

a. Provide sound-deadening pads or gaskets at contact points between heads and panels.

B. Stringer Systems: Modular steel stringer systems designed to bolt to pedestal heads and form a grid pattern. Protect steel components with manufacturer's standard galvanized or corrosion-resistant paint finish.

1. Continuous Gaskets: At contact surfaces between panel and stringers to deaden sound, seal off the underfloor cavity from above, and maintain panel alignment and position.

2.5 FABRICATION

A. Fabrication Tolerances:

1. Size: Plus or minus 0.020 inch of required size.
2. Squareness: Plus or minus 0.015 inch between diagonal measurements across top of panel.
3. Flatness: Plus or minus 0.035 inch, measured on a diagonal on top of panel.

B. Panel Markings: Clearly and permanently mark floor panels on their underside with panel type and concentrated-load rating.

C. Cutouts: Fabricate cutouts in floor panels for cable penetrations and service outlets. Provide reinforcement or additional support, if needed, to make panels with cutouts comply with structural performance requirements.

1. Number, Size, Shape, and Location: As indicated.
2. Provide foam-rubber pads for sealing annular space formed in cutouts by cables.

2.6 ACCESSORIES

A. Adhesives: Manufacturer's standard adhesive for bonding pedestal bases to subfloor.

1. Adhesive shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Post-Installed Anchors: For anchoring pedestal bases to subfloor, provide four post-installed expansion anchors made from carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 (Mild), with the capability to sustain, without failure, a load equal to 1.5 times the loads imposed by pedestal overturning moment on fasteners, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

C. Cavity Dividers: Provide manufacturer's standard metal dividers located where indicated to divide underfloor cavities.

D. Closures: Where underfloor cavity is not enclosed by abutting walls or other construction, provide metal-closure plates with manufacturer's standard finish.

E. Steps: Provide steps of size and arrangement indicated with floor coverings to match access flooring. Apply nonslip aluminum nosings to treads unless otherwise indicated.

F. Panel Lifting Device: Panel manufacturer's standard portable lifting device for each type of panel required.

G. Perimeter Support: Where indicated, provide manufacturer's standard method for supporting panel edge and forming transition between access flooring and adjoining floor coverings at same level as access flooring.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer and manufacturer's representative present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, foreign deposits, and debris that might interfere with attachment of pedestals.

2. Verify that concrete floor sealer and finish have been applied and cured.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Lay out floor panel installation to keep the number of cut panels at floor perimeter to a minimum. Avoid using panels cut to less than 6 inches.

B. Locate each pedestal, complete any necessary subfloor preparation, and vacuum subfloor to remove dust, dirt, and construction debris before beginning installation.

3.3 INSTALLATION

A. Install access-flooring system and accessories under supervision of access-flooring manufacturer's authorized representative to produce a rigid, firm installation that complies with performance requirements and is free of instability, rocking, rattles, and squeaks.

B. Adhesive Attachment of Pedestals: Set pedestals in adhesive, according to access-flooring manufacturer's written instructions, to provide full bearing of pedestal base on subfloor.

C. Mechanical Attachment of Pedestals: Attach pedestals to subfloor with post-installed mechanical anchors.

D. Adjust pedestals to permit top of installed panels to be set flat, level, and to proper height.

E. Stringer Systems: Secure stringers to pedestal heads according to access-flooring manufacturer's written instructions.

F. Install flooring panels securely in place, properly seated with panel edges flush. Do not force panels into place.

G. Scribe perimeter panels to provide a close fit with adjoining construction with no voids greater than 1/8 inch where panels abut vertical surfaces.

1. To prevent dusting, seal cut edges of steel-encapsulated, wood-core panels with sealer recommended in writing by panel manufacturer.

H. Cut and trim access flooring and perform other dirt-or-debris-producing activities at a remote location or as required to prevent contamination of subfloor under already-installed access flooring.

I. Clean dust, dirt, and construction debris caused by floor installation, and vacuum subfloor area as installation of floor panels proceeds.

J. Install access flooring without change in elevation between adjacent panels and within the following tolerances:

1. Plus or minus 1/16 inch in any 10-foot distance.
2. Plus or minus 1/8 inch from a level plane over entire access-flooring area.

3.4 PROTECTION

A. Prohibit traffic on access flooring for 24 hours and removal of floor panels for 72 hours after installation to allow pedestal adhesive to set.

B. After completing installation, vacuum access flooring and cover with continuous sheets of reinforced paper or plastic. Maintain protective covering until time of Substantial Completion.

C. Replace access-flooring panels that are stained, scratched, or otherwise damaged or that do not comply with specified requirements.

END OF SECTION 096900

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes suspended acoustical panels.

B. Related Sections include the following:

1. Division 9 Section "Acoustical Panel Ceilings" for acoustical ceiling panels supported by exposed suspension system and tested for noise reduction.

1.3 DEFINITIONS

A. NRC: Noise reduction coefficient.

B. SAA: Sound absorption average.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, mounting, material descriptions, dimensions of individual components and profiles, and finishes for sound-absorbing ceiling units.
2. Include furnished specialties and accessories.

B. Shop Drawings: For sound-absorbing ceiling units.

1. Include plans, elevations, sections, and mounting devices and details.
2. Include details at joints and corners; and details at ceiling intersections and intersections with walls. Indicate panel edge and core materials.
3. Include reflected ceiling plans showing panel sizes and direction of fabric weave and pattern matching.

C. Samples for Initial Selection: For each type of fabric facing from sound-absorbing ceiling unit manufacturer's full range.

D. Samples for Verification: For the following products:

1. Fabric: Full-width by approximately 36-inch- long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
2. Panel Edge: 12-inch- long Sample(s) showing each edge profile, corner, and finish.
3. Core Material: 12-inch- square Sample at corner.
4. Mounting Devices: Full-size Samples.
5. Assembled Panels: Approximately 36 by 36 inches, including joints and mounting methods.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Electrical outlets, switches, and thermostats.
2. Suspended ceiling components above sound-absorbing ceiling units.
3. Structural members to which suspension devices will be attached.
4. Items penetrating or covered by sound-absorbing ceiling units including the following:

    a. Lighting fixtures.
    b. Alarms.
    c. Sprinklers.

5. Show operation of hinged and sliding components covered by or adjacent to sound-absorbing ceiling units.

B. Product Certificates: For each type of sound-absorbing ceiling unit.

C. Sample Warranty: For special warranty.

1.6 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. Source Limitations: Obtain acoustical wall panels through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide acoustical wall panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.

1. Install mockups in the location and of the size indicated or, if not indicated, as directed by Architect.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabric and acoustical wall panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

C. Protect panel edges from crushing and impact.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical wall panels until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install acoustical wall panels until a permanent level of lighting is provided on surfaces to receive acoustical wall panels.

C. Air-Quality Limitations: Protect acoustical wall panels from exposure to airborne odors, such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify locations of acoustical wall panels by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of acoustical wall panels that fail in performance, materials, or workmanship within specified warranty period.

1. Failure in performance includes, but is not limited to, acoustical performance.
2. Failures in materials include, but are not limited to, fabric sagging, distorting, or releasing from panel edge; or warping of core.
3. Warranty Period: Two years from date of Substantial Completion.

1.10 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fabric: For each fabric, color, and pattern installed, provide length equal to 10 percent of amount installed, but no fewer than 10 yards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acoustical Panel Systems (APS, Inc.).
2. Acoustical Solutions, Inc.
3. Decoustics Limited; a CertainTeed Ceilings company.
4. Golterman & Sabo.
5. Kinetics Noise Control, Inc.

B. Source Limitations: Obtain sound-absorbing ceiling units from single source from single manufacturer.

2.2 CORE MATERIALS

A. Glass-Fiber Board: ASTM C 612, Type IA or Types IA and IB; density as specified, unfaced, dimensionally stable, molded rigid board, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.3 SUSPENDED ACOUSTICAL PANELS WITH GLASS-FIBER BOARD CORE

A. Suspended Acoustical Panels, General:

1. Fabricate panels to sizes and configurations indicated; attach facing materials to cores to product installed panels with visible surfaces fully covered and free from waves in fabric weave, wrinkles, sags, blisters, seams, adhesive, or other foreign matter.

B. Sound Absorption Performance: Provide acoustical panels with minimum acoustical absorption coefficients indicated, as determined by testing per ASTM C 423 for mounting type specified under individual product requirements.

1. Nominal overall panel thickness of 2 inches and the following minimum sound absorption coefficients for an ASTM C 423, Standard Reverberation Room Test using Type ABPMA No. 4) mounting.

FREQ.	125	250	500	1K	2K	4K	NRC
(Hz)	0.16	0.71	1.00	1.00	0.99	0.99	0.95

C. Colors, Textures, and Patterns: Where manufacturer's standard material is indicated, provide acoustical wall panels faced with manufacturer's material complying with the following requirements:

1. Match Architect's samples or provide Architect's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.

D. Available Products: Subject to compliance with requirements, acoustical fabrics and textiles that may be incorporated in the work include, but are not limited to, the following;

1. Capaul Corporation.
2. Decoustics, LTD.
3. Sound Reduction Corporation.
4. USG Interiors.
5. Wall Technology.

E. Panel Construction: Manufacturer's standard panel construction consisting of facing material laminated to front face of a dimensionally stable, rigid glass-fiber board core with a nominal density of 6 to 7 lb/cu. ft.; with long edges kerfed and rabbeted to receive splines.

1. Facing Material: Panels shall be faced with acoustically transparent fabric in accordance with paragraph 2.3.
2. Panel Size: As indicated.
3. Nominal Overall Panel Thickness: 2 inches.
4. Panel Edge: Manufacturer's standard.
5. Panel Short Edge Detail: Square.

2.4 ACOUSTICALLY TRANSPARENT FABRIC / TEXTILE WALL COVERING

A. General: Covering will be stain resistant and suitable for use in high traffic areas; and must comply with Class A ASTM E 84 and ASTM D 1682 standards. Coverings must be essentially transparent to sound with less than 1 dB attenuation at 2000 Hz.

B. Polypropylene Fabrics: 100% polypropylene fibers and yarns 24 oz. per linear yard. Product shall meet ASTM D 3597-89 surface resistance standard (heavy-duty commercial) and be suitable for use in high traffic areas.

C. Available Products: Subject to compliance with requirements, acoustical fabrics and textiles that may be incorporated in the work include, but are not limited to, the following:

1. "High Plains", Wall Technology, Inc.
2. "Vertex", Sound Systems Acoustical Wallcoverings, Technique Wall Coverings.
3. "Elevations", Ozite Corporation.

2.5 FABRICATION

A. Sound-Absorption Performance: Provide suspended acoustical panels with minimum NRCs indicated, as determined by testing per ASTM C 423 for mounting type specified.

B. Suspened Acoustical Panels: Panel construction consisting of facing material adhered to face, edges and back of dimensionally stable core; with rigid edges to reinforce panel perimeter against warpage and damage.

1. Glass-Fiber Board: Resin harden areas of core for attachment of mounting devices.

C. Fabric Facing: Stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other foreign matter. Applied with visible surfaces fully covered.

1. Where square corners are indicated, tailor corners.

D. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:

1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.

E. Suspended Panel Accessories: Manufacturer's standard concealed attachment hardware.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine project conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of suspended acoustical panels.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install suspended acoustical panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

1. Cut units to be at least 50 percent of unit width, with facing material extended over cut edge to match uncut edge. Scribe acoustical wall panels to fit adjacent work. Butt joints tightly.

B. Comply with acoustical panel manufacturer's written instructions for installation of panels using type of concealed mounting accessories indicated or, if not indicated, as recommended by manufacturer. Anchor panels securely to supporting substrate.

C. Match and level fabric pattern and grain among adjacent panels.

D. Installation Tolerances: As follows:

1. Variation from Level and Plumb: Plus or minus 1/16 inch.
2. Variation of Panel Joints from Hairline: Not more than 1/16 inch wide.

3.3 CLEANING

A. Clip loose threads; remove pills and extraneous materials.

B. Clean panels with fabric facing, on completion of installation, to remove dust and other foreign materials according to manufacturer's written instructions.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that acoustical wall panels are without damage or deterioration at time of Substantial Completion.

B. Replace acoustical wall panels that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 098413

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes surface preparation and field painting and staining of exposed exterior and interior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

D. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
2. Division 6 Section "Interior Architectural Woodwork" for shop priming interior architectural woodwork.
3. Division 8 Section "Hollow Metal Doors and Frames" for factory priming steel doors and frames.
4. Division 9 Section "Gypsum Board " for surface preparation of gypsum board.

1.3 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
3. Product characteristics
4. Surface preparation instructions and recommendations
5. Primer requirements and finish specification
6. Storage and handling requirements and recommendations
7. Application methods
8. Cautions, VOC’s

B. Samples for Initial Selection: For each type of finish-coat material indicated.

1. After color selection, Architect will furnish color chips for surfaces to be coated.

C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
3. Submit 3 Samples on the following substrates for Architect's review of color and texture only:

    a. Concrete Unit Masonry: 4-by-8-inch Samples of masonry, with mortar joint in the center, for each finish and color.
    b. Painted Wood: 8-inch- square Samples for each color and material on hardboard.
    c. Stained or Natural Wood: 4-by-8-inch Samples of natural- or stained-wood finish on representative maple surfaces.
    d. Ferrous Metal: 4-inch- square Samples of flat metal and 6-inch- long Samples of solid metal for each color and finish.

D. Qualification Data: For Applicator.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.

1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.

    a. Wall Surfaces: Provide samples on at least 100 sq. ft.
    b. Small Areas and Items: Architect will designate items or areas required.

2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.

    a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.

3. Final approval of colors will be from benchmark samples.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).

3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.
9. Product name, and type (description)
10. Application & use instructions
11. Surface preparation
12. VOC content
13. Environmental issues
14. Batch date
15. Color number/name

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.
2. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
3. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.
4. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.6 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.7 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

1. Quantity: Furnish Owner with an additional 5 percent, but not less than 1 gal. or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Paint Manufacturers: Subject to compliance with requirements, provide products from one of the following:

1. Sherwin-Williams Co. (SW).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:

1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
2. Non-Flat Paints and Coatings: VOC content of not more than 150 g/L.
3. Anticorrosive Coatings: VOC content of not more than 250 g/L.
4. Varnishes and Sanding Sealers: VOC content of not more than 350 g/L.
5. Stains: VOC content of not more than 250 g/L.
6. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
7. Restricted Components: Paints and coatings shall not contain any of the following:

a. Acrolein.
b. Acrylonitrile.
c. Antimony.
d. Benzene.
e. Butyl benzyl phthalate.
f. Cadmium.
g. Di (2-ethylhexyl) phthalate.
h. Di-n-butyl phthalate.
i. Di-n-octyl phthalate.
j. 1,2-dichlorobenzene.
k. Diethyl phthalate.
l. Dimethyl phthalate.
m. Ethylbenzene.
n. Formaldehyde.
o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

D. Colors: As selected by Architect from manufacturer's full range, match the scheduled paint colors and finishes indicated on the drawings.

E. Joint Sealants: Provide custom color joint sealant as selected by Architect at juncture where two colors interface. Refer to Division 07 Section “Joint Sealants” for requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

    a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.

c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
c. If transparent finish is required, backprime with spar varnish.
d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.

a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
10. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Uninsulated metal piping.
2. Uninsulated plastic piping.
3. Pipe hangers and supports.
4. Tanks that do not have factory-applied final finishes.
5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.

7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

G. Electrical items to be painted include, but are not limited to, the following:

1. Conduit and fittings.
2. Switchgear.
3. Panelboards.
4. Electrical equipment that is indicated to have a factory-primed finish for field painting.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

L. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 EXTERIOR PAINT SCHEDULE

A. Galvanized Steel: Acrylic Semi-Gloss Enamel Paint (primer and 2 finish coats).

1. 1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (5-10 mils wet, 2-4 mils dry)
2. 2nd Coat:S-W Harmony Low Odor Interior Latex Flat, B5 Series
3. 3rd Coat: S-W Harmony Low Odor Interior Latex Flat, B5 Series (4 mils wet, 1.6 mils dry per coat).

3.7 INTERIOR PAINT SCHEDULE

A. Concrete Masonry Unit: Latex Eggshell/Satin Paint (primer and 2 finish coats).

1. 1st Coat:S-W PrepRite Block Filler, B25W25 (16 mils wet, 8 mils dry)
2. 2nd Coat: S-W Harmony Low Odor Interior Latex Flat, B5 Series
3. 3rd Coat: S-W Harmony Low Odor Interior Latex Flat, B5 Series (4 mils wet, 1.6 mils dry per coat).

B. Structural Steel and Hollow Metal: Latex Semi-gloss Paint (primer and 2 finish coats.

1. 1st Coat: S-W Pro Industrial Pro-Cryl® Universal Primer, B66-310 Series (5-10 mils wet, 2-4 mils dry)
2. 2nd Coat: S-W Harmony Low Odor Interior Latex Flat, B5 Series
3. 3rd Coat: S-W Harmony Low Odor Interior Latex Flat, B5 Series (4 mils wet, 1.6 mils dry per coat).

C. Wood: Latex Semi-Gloss Paint (primer and 2 finish coats).

1. 1st Coat:S-W PrepRite® ProBlock® Latex Primer, B51 Series (4 mils wet, 1.4 mils dry)
2. 2nd Coat: S-W Harmony Low Odor Interior Latex Eg-Shel, B9 Series
3. 3rd Coat: S-W Harmony Low Odor Interior Latex Eg-Shel, B9 Series (4 mils wet, 1.6 mils dry per coat)

D. Gypsum Drywall: Acrylic Latex Paint (primer and 2 finish coats).

1. Flat Sheen:

    a. 1 st Coat: S-W Harmony Low Odor Interior Latex Primer, B11W900 (4 mils wet, 1.3 mils dry per coat)
    b. 2nd Coat: S-W Harmony Low Odor Interior Latex Flat, B5 Series
    c. 3rd Coat: S-W Harmony Low Odor Interior Latex Flat, B5 Series (4 mils wet, 1.6 mils dry per coat)

2. Eggshell/Satin Sheen:

    a. 1st Coat: S-W Harmony Low Odor Interior Latex Primer, B11W900 (4 mils wet, 1.3 mils dry per coat)
    b. 2nd Coat: S-W Harmony Low Odor Interior Latex Eg-Shel, B9 Series
    c. 3rd Coat: S-W Harmony Low Odor Interior Latex Eg-Shel, B9 Series (4 mils wet, 1.6 mils dry per coat)

3. Semi-gloss Sheen:

    a. 1st Coat: S-W Harmony Low Odor Interior Latex Primer, B11W900 (4 mils wet, 1.3 mils dry per coat)
    b. 2nd Coat: S-W Harmony Low Odor Interior Latex Semi-Gloss, B10 Series

c. 3rd Coat: S-W Harmony Low Odor Interior Latex Semi-Gloss, B10 Series (4 mils wet, 1.6 mils dry per coat)

END OF SECTION 099100

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

C. This Section includes the following:

1. Vinyl wall covering.

D. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 9 Section "Painting" for primers, coatings, and paint for woven glass-fiber wall coverings.
2. Division 9 Section "Painting" for priming wall surfaces.

1.3 SUBMITTALS

C. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

D. Product Data for each type of product specified. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.

E. Samples for initial selection in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available.

F. Samples for verification in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.

1. Wall Covering Material: not less than 12” x 12”, from dye lot used for the Work.

a. Submit sample with specified treatments applied.
b. Mark top and face of material.
c. Show complete pattern repeat.

G. Maintenance data for wall covering to include in the operation and maintenance manual specified in Division 1.

1.4 QUALITY ASSURANCE

C. Installer Qualifications: Engage an experienced installer who has completed 5 projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

D. Fire-Test-Response Characteristics: Provide wall coverings with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Flame Spread: 25 or less.
2. Smoke Developed: 450 or less.

1.5 PROJECT CONDITIONS

C. Space Enclosure and Environmental Limitations: Do not install wall covering until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

D. Lighting: Do not install wall covering until a lighting level of not less than 15 foot-candles (160 lux) is provided on the surfaces to receive wall covering.

E. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by the wall covering manufacturer for full drying or curing.

1.6 EXTRA MATERIALS

C. Furnish extra materials described below, before installation begins, that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Rolls of Wall Covering Material: Full-size units equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

C. Products: Subject to compliance with requirements, provide the product specified in the Room Finish Schedule in the drawings.

2.2 ADHESIVES

C. General: Mildew-resistant, nonstaining adhesive, for use with specific wood-veneer wall covering and substrate application, as recommended by wall covering manufacturer.

2.3 ACCESSORIES

C. Wall Liner: Nonwoven, synthetic underlayment and adhesive as recommended by wall covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

C. Examine substrates for compliance with requirements for moisture content and other conditions affecting performance of Work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

C. Comply with manufacturer's written instructions for surface preparation.

D. Clean substrates of substances that could impair wall covering's bond, including mold, mildew, oil, grease, incompatible primers, and dirt.

E. Prepare substrates to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, and defects.

1. Painted Surfaces: Treat areas susceptible to pigment bleeding.
2. Metals: If not factory primed, clean and apply rust-inhibitive zinc primer.
3. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
4. Prime new gypsum board with primer recommended by wall covering manufacturer.
5. Allow new plaster to cure. Treat areas of high alkalinity.

F. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finishes with fine sandpaper.

G. Install wall liner, with no gaps or overlaps, where required by wall covering manufacturer. Form smooth wrinkle-free surface for finished installation. Do not begin wall covering installation until wall liner has dried.

H. Acclimatize wall covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION, GENERAL

C. General: Comply with wall coverings manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

D. Cut wall covering panels in roll number sequence. Change run numbers at partition breaks and corners only.

E. Install wall covering with no gaps or overlaps.

F. Pattern match per manufacturer instructions.

G. Install seams vertical and plumb at least 6 inches (150 mm) from outside corners and 3 inches (75 mm) from inside corners. No horizontal seams.

H. Remove air bubbles, wrinkles, blisters, and other defects.

I. Trim edges for color uniformity, pattern match, and tight closure at seams and edges. Butt seams.

J. Change blade after each cut on the wall covering.

3.4 CLEANING

C. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

D. Use cleaning methods recommended by wall covering manufacturer.

E. Replace strips that cannot be cleaned.

END OF SECTION 099500

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Glass Markerboards.

1.3 SUBMITTALS

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

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: For each type of visual display surface indicated and as follows:

1. Actual sections of porcelain-enamel face sheet and magnetic glass.
2. Samples for color selection.

D. Samples for Verification: For each type of visual display surface indicated and as follows:

1. Visual Display Surface: Not less than 8-1/2 by 11 inches, mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
2. Display Rail: 6 inches length.

E. Qualification Data: For Installer.

F. Maintenance Data: For visual display surfaces to include in maintenance manuals.

G. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of motor-operated, sliding visual display unit manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain each type of visual display surface through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of visual display surfaces and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Fire-Test-Response Characteristics: Provide fabrics with the surface-burning characteristics indicated, as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency

acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display boards, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display units vertically with packing materials between each unit.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Surfaces lose original writing and erasing qualities.
b. Surfaces exhibit crazing, cracking, or flaking.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Glass Sheet: Low-iron, tempered safety glass.

B. Adhesives: Manufacturer's standard product that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 GLASS MARKERBOARD UNITS: Subject to compliance with requirements, provide products by the following:

A. Refer to Finish Schedule indication.

1. Manufacturer: Skyline Design-Vitacolor Marker/Magnetic, or approved equal.
2. Material: Glass/Metal with Back-Painted surface.
3. Color: Custom, to be selected by Architect.
4. Location: Where indicated on the drawings.

2.3 MARKERBOARD ACCESSORIES

A. Marker/Eraser tray: Manufacturer's standard, extruded aluminum, box type with slanted front. Painted plastic is not acceptable.

B. Markers/Eraser/Clothe: Provide one set of each for each board location.

2.4 FABRICATION

A. Fabricate visual display surfaces to sizes indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Examine walls and partitions for proper backing for visual display surfaces.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

3.3 INSTALLATION OF VISUAL DISPLAY UNITS

A. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, and substances that will impair bond between visual display boards and surfaces.

B. Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

C. Glass Visual Display Boards: Attach supports, to wall surfaces and to visual display boards as required by the board or glass manufacture. Secure both top and bottom of boards to walls.

3.4 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 101100

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Interior Signs.

a. Room Identification signage.
b. ADA signage
c. Life safety signage.

B. Related Sections include the following:

1. Division 1 Section "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
2. Division 22 and 23 Sections for labels, tags, and nameplates for mechanical equipment.
3. Division 26 Sections for electrical service and connections for illuminated signs.
4. Division 26 Section "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
5. Division 26 Section "Interior Lighting" for illuminated Exit signs.

1.3 DEFINITIONS

1. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines" and "Indiana Accessibility Code".

1.4 SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation details for panel signs.

1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

a. Verify copy for each sign with Owner.

C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available.

D. Samples for Verification: For the full range of color, texture, and sign material indicated, of sizes indicated:

1. Panel Signs: Fiberglass Sheet: 8 by 10 inches for each color required.

E. Qualification Data: For Installer and fabricator.

F. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. 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.

C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of metal finishes beyond normal weathering.
b. Deterioration of embedded graphic image.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL SIGNS

A. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:

B. Manufacturer: Basis of design- Alumigraph by AG Systems.

1. Fiberglass Sheet: 0.25-inch- thick sheet.
2. Signs shall be of one-piece construction; added-on and/or engraved characters are unacceptable.
3. Text shall be accompanied by universal symbols and Grade 2 braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
4. Tactile characters/symbols shall be raised 1/32” from the sign face plate.
5. All letters, numbers and symbols shall contrast with the background; either light characters on dark background or dark characters on light background.
6. Character height,

a. Typical: 5/8”.
b. Numerical characters for maximum occupant count: 1”.
c. Symbols: 3”.

7. Font: Helvetica, upper and lower case.
8. Letters and numbers shall be centered on the sign panel.
9. Panel Size: As required to accommodate required copy, symbol and Braille, but no less than the sizes indicated in the sign panel schedule below.
10. Corners: Rounded.
11. Edges: Provide 1/4" raised border around each sign panel.
12. Graphic Process/Fabrication: Graphic Blast; Machine engrave letters, numbers, and symbols into panel sign on face by removing surrounding background, to produce precisely formed copy, incised to uniform depth. Paint the background with marine grade paint. Color for copy and painted background shall be selected by Architect from Manufacturer's full range.
13. Mounting: Double-faced adhesive foam tape.
14. Colors: As selected by the Architect from Fabricators full line of colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify that areas and surfaces to receive signs are ready for work of this Section.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate signs and accessories at height and location as required by applicable Accessibility Codes, using mounting methods of types described and complying with manufacturer's written instructions. Where exact location is not indicated or dictated by Code, or where insufficient room is available to install sign, request clarification from Architect.

1. Install signs level, plumb, with sign surfaces free of distortion and other defects in appearance.

3.3 SIGNAGE SCHEDULE

A. Signage is to be a delegated design provided by the Contractor and is to include room identification, required ADA signage and live safety code related signage

3.4 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 101400

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Cutout dimensional characters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For dimensional letter 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, and layout for each sign at least ½" = 1' scale.

C. Samples for Verification: For each type of sign assembly showing all components and with the required finish, in manufacturer's standard size unless otherwise indicated and as follows:

1. Dimensional Characters: Full-size Sample of a dimensional character.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

A. Cutout or Cast Characters with uniform faces; square-cut, smooth edges; precisely formed lines and profiles; and as follows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. A. R. K. Ramos Signage Systems.
b. ASI Sign Systems, Inc.
c. Gemini Incorporated.
d. InPro Corporation.
e. Metal Arts; Division of L & H Mfg. Co.
f. Metallic Arts.

2. Character Material: Sheet or plate aluminum, or cast aluminum, Contractors option.
3. Character Height: Varies, refer to drawings.
4. Thickness: 0.375 inches.
5. Finishes:

a. Integral Aluminum Finish: Clear anodized.

6. Mounting: Concealed projecting studs – 0.25 inches from face of wall.
7. Typeface: Geometric 415, medium bold.
8. Message: Text as indicated on drawings.

2.2 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.

B. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.3 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.

B. Adhesives: As recommended by sign manufacturer.

2.4 GENERAL FINISH REQUIREMENTS

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

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.5 ALUMINUM FINISHES

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Mounting Methods:

1. Concealed Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface. Confirm wood blocking, plywood sheathing, or metal straps back-up installed for anchorage of letters.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Nonilluminated, single-sheet-type post and panel signs.

B. Related Sections include the following:

1. Division 1 Section "Temporary Facilities and Controls" for temporary Project identification and temporary informational and directional signs.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Include manufacturer's written instructions for maintaining and cleaning sign surfaces.

B. Shop Drawings: Show installation details for post and panels signs.

1. Include plans, elevations, and at least 3/4-inch scale sections of typical members and other components. Show anchors, reinforcement, accessories, layout, and installation details.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain post and panel signs through one source from a single manufacturer.

1.5 DELIVERY AND HANDLING

A. Deliver post and panel signs in protective covering and crating to protect sign components and surfaces against damage.

1.6 COORDINATION

A. Coordinate installation of anchorages for post and panel signs. Furnish setting drawings, templates, and directions for installing anchorages and other items that are to be embedded in concrete. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Andco Industries Corporation.
2. APCO Graphics
3. ASI Sign System, Inc.
4. Innerface Sign Systems, Inc.

5. Signcraft, Inc.
6. Signature Signs, Inc.
7. Supersine Company (The).
8. Vomar Products, Inc.

2.2 MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of alloy 5005-H15.

B. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500, Grade B.

2.3 ACCESSORIES

A. Fasteners: Use concealed fasteners fabricated from metals that are noncorrosive to sign material and mounting surface.

B. Concrete for Postholes: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 2500 psi, unless otherwise indicated.

2.4 POSTS

A. General: Fabricate posts to lengths required for mounting method indicated.

1. Direct-Burial Method: Provide posts 36 inches longer than height of sign to permit direct embedment in concrete foundations.

B. Steel Posts: Fabricate from 0.120-inch- thick, square steel tubing. Include post caps, fillers, spacers, and related accessories required for complete installation. Hot-dip galvanize post assemblies after fabrication to comply with ASTM A 123.

1. Post Size: 2 inches square.
2. Post Finish: Galvanized.

2.5 SIGN PANELS

A. General: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

B. Unframed Single-Sheet Panels: Provide unframed single-sheet sign panels with edges mechanically and smoothly finished.

1. Panel Material: 0.125-inch- thick aluminum sheet.

a. Panel Finish: Baked enamel.
b. Background Color: Blue.
c. Copy Color: White silkscreen.

2. Edge Condition: Square cut.
3. Corner Condition: Rounded.
4. Type: Single-sided accessible parking sign, ADA compliant, as shown on the Drawings.

2.6 ALUMINUM FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 1.5 mils, medium gloss.
2. Color: As indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavation: In firm, undisturbed or compacted soil, drill or (using a post-hole digger) hand-excavate holes for posts to diameters and spacing indicated.

1. Excavate hole depths approximately 39 inches below finished grade.

B. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation.

1. Protect portion of posts above ground from concrete splatter. Place concrete and vibrate or tamp for consolidation. Check posts for alignment and hold in position until concrete has achieved its initial set.

C. Install signs level, plumb, and at height indicated, with surfaces properly oriented, free from distortion or other defects in appearance.

3.2 CLEANING

A. At completion of installation, clean soiled surfaces of sign units according to manufacturer's written instructions.

END OF SECTION 101426

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes stainless-steel units as follows:

1. Toilet Enclosures: Floor mounted, overhead braced.
2. Urinal Screens: Wall hung.

B. Related Sections include the following:

1. Division 6 Section " Miscellaneous Rough Carpentry" for blocking.
2. Division 10 "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of cutouts for compartment-mounted toilet accessories.
2. Show locations of reinforcements for compartment-mounted grab bars.

C. Samples for Initial Selection: For each type of unit indicated.

D. Samples for Verification: Of each type of color and finish required for units, prepared on 6-inch- square Samples of same thickness and material indicated for Work.

1.4 QUALITY ASSURANCE

A. Comply with requirements in CID-A-A-60003, "Partitions, Toilets, Complete."

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 METAL UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Accurate Partitions Corporation.
2. Bradley Corporation; Mills Partitions.
3. Flush Metal Partition Corp.
4. General Partitions Mfg. Corp.

5. Metpar.

B. Stainless-Steel Units: Facing sheets and closures fabricated from ASTM A 666, Type 302 or 304, stainless-steel sheet, leveled to stretcher-leveled flatness.

1. Stainless-Steel Facing Sheet Thicknesses: Specified thicknesses as follows:

a. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.0375 inch.
b. Pilasters, Unbraced at One End: Manufacturer's standard thickness, but not less than 0.050 inch.
c. Panels: Manufacturer's standard thickness, but not less than 0.0312 inch.
d. Doors: Manufacturer's standard thickness, but not less than 0.0312 inch.
e. Integral-Flange, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than 0.0312 inch.
f. Wedge-Shaped, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than 0.0375 inch.

2. Finish: No. 4 bright, directional polish on exposed faces. Exposed surfaces are protected from damage by application of strippable, temporary protective covering before shipment.

C. Toilet-Enclosure Style: Floor Mounted, overhead braced.

D. Urinal-Screen Style: Wall hung flat panel.

E. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets are pressure laminated to core material. Units have continuous, interlocking molding strip or lapped and formed edge closures. Exposed surfaces are free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections. Corners are sealed by welding or clips. Exposed welds are ground smooth.

1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.
2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.
3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.
4. Urinal-Screen Construction: Matching panels.

F. Pilaster Shoes and Sleeves (Caps): Stainless steel, ASTM A 666, Type 302 or 304, not less than 0.0312 inch specified thickness and 3 inches high, finished to match hardware.

G. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

2.2 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Stainless steel.

B. Support Posts for Urinal Screens: Manufacturer's standard aluminum post with floor shoe for anchoring to floor construction.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. Ceiling-Hung Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.

B. Doors: 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 indicated to be accessible to people with disabilities.

1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.
3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 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. Brackets: Secure panels to walls and to pilasters with continuous brackets.

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. Wall-Hung Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to 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-swinging doors to return doors to fully closed position.

END OF SECTION 102113

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes acoustically rated, manually-operated, flat-panel partitions supported from an overhead track.

1.3 SUBMITTALS

A. Product Data: For operable sliding panel partition indicated.

B. Shop Drawings: Include plans, elevations, sections, details, details of installation, accessories, attachments to other Work, weights, and required installation, storage, and operating clearances.

1. Calculations: Calculate requirements for supporting operable panel partitions and verify capacity of carriers and track components to support loads; indicate deflection limits for partition and adjacent construction.
2. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

C. Setting Drawings: For embedded items and cutouts required in other work, including support beam punching template.

D. Samples: For each exposed finish and for each color, pattern and texture required.

1. Fabric: Full width by not less than 36-inch- long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat.
2. Panel Face Material: Manufacturer's standard-size unit, not less than 3 inches square.
3. Panel Edge Material: Not less than full width by 3 inches long.

E. Product test reports.

F. Maintenance data.

1.4 QUALITY ASSURANCE

A. Acoustical Performance Characteristics: Provide operable panel partitions identical to those tested by a qualified testing agency per test methods indicated.

1. Sound Transmission Class: Test assembly in a full-scale opening, 14 by 9 feet, per ASTM E 90 and classified per ASTM E 413.

B. Fire-Test-Response Characteristics: Provide products tested per test method indicated by a testing agency acceptable to authorities having jurisdiction:

1. Surface Burning: Flame-spread and smoke-developed indices of 25 and 450, respectively, per ASTM E 84.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide the specified products or comparable products by one of the following manufacturers:

1. Hufcor Inc.
2. Or Approved Equal.

B. Basis-of-Design Products: Subject to requirements, provide the following products or equivalent products by another listed manufacturer:

1. Operable Panel Partition: Acousti-Seal Single Panel Model 931 Steel Operable Wall Individual Panels by Modernfold, Inc.
2. Suspension System: #14 track system bracket mount, with auto switch and curve stacking, by Modernfold, Inc.

2.2 MATERIALS

A. Steel Frame: Steel sheet, manufacturer’s standard thickness for uncoated steel.

B. Steel Face/Liner Sheets: Tension-leveled steel sheet.

2.3 OPERABLE PANEL PARTITIONS, GENERAL

A. Panel Construction: Fabricate panels with top reinforcement as required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.

1. Fabricate operable panel partitions from manufacturer's standard sizes, to form assembled systems indicated.

B. Panel Skin: Gypsum board, 1/2-inch thick, single or composite layers continuously bonded to panel frame.

C. Trim: Manufacturer's standard aluminum trim, clear anodized or painted in color as selected from manufacturer's full range.

D. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories, with decorative, protective finish.

E. Acoustical Seals:

1. Vertical Seals: Deep-nesting, interlocking astragals mounted on each edge of panel, with continuous PVC acoustical seal.
2. Horizontal Top Seals: Continuous-contact, extruded PVC seal exerting uniform constant pressure on track when extended.
3. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.

a. Automatically Operated: Extension and retraction of bottom seal automatically operated by movement of partition, with nominal operating clearance of 1 inch between retracted seal and floor finish and an operating range not less than 1/2 inch.

F. Finish Facing: Factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.

1. Vinyl-Coated Fabric Wall Covering: Customer's Own Material, as indicated on drawings.

G. Suspension System:

1. Tracks: Steel or aluminum with adjustable steel hanger rods for overhead support; designed for type of operation, size, and weight of operable panel partition indicated; in continuous system of track sections and accessories to accommodate partition operation and storage configuration indicated.

a. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction.
b. Limit track deflection to no more than 0.10 inch between bracket supports.

2. Panel Guide: Aluminum or steel, finished with factory-applied, decorative, protective finish.
3. Track Head Closure Trim: As required for acoustical performance, with factory-applied protective finish. Trim to be field-painted with semi-gloss enamel as specified in Division 9 Section "Painting," color as selected.
4. Multidirectional Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.
5. Track Intersections, Switches, and Accessories: As required for type of operation, storage, track configuration, and layout indicated for operable panel partition, and compatible with partition assembly specified. Fabricate track intersections and switches from steel or aluminum.
6. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish, unless otherwise indicated.
7. Steel Finish: Factory-applied, corrosion-resistant, protective coating, unless otherwise indicated.

H. Pass Doors: Fabricated to comply with recommendations in ICC/ANSI A117.1. Swinging door built into and matching panel materials, acoustical qualities, and finish, and thickness, complete with frames and operating hardware. Hinges finished to match other exposed hardware.

1. Single Pass Door: 36 by 80 inches, with the following:

a. Door Seals: Sweep floor seals.
b. Fire exit device.
c. Concealed door closer.
d. Door Viewer: Installed with view in direction of swing.
e. Exit Sign: Recessed, self-illuminated.

I. Storage Pocket Door: Manufacturer's standard with plastic laminate face.

2.4 OPERABLE PANEL PARTITION:

A. Partition Operation and Configuration: Manually operated, individual panels.

B. STC: Sound transmission class of not less than 50.

C. Panel Construction: Manufacturer's standard panel construction complying with requirements indicated.

D. Panel Width: Manufacturer’s standard, 48 inch maximum.

E. Panel Weight: 8 lb/sq. ft. maximum.

F. Panel Thickness: Not less than 3 inches.

G. Edges: Manufacturer's standard.

H. Initial Closure: Fixed jamb.

I. Final Closure: Constant-force, crank or lever-operated, mechanical closure expanding from panel edge to create a constant-pressure acoustical seal.

J. Finish Facing: Vinyl-coated fabric wall covering complying with CFFA-W-101-B, Type I.

1. Total Weight: Not less than 15 oz/lin yd.
2. Color/Pattern: As indicated on the drawings

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Comply with ASTM E 557 and operable panel partition manufacturer's written installation instructions.

C. Adjust operable panel partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.2 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 102226

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes manually operated, glass-panel partitions.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach supporting tracks to overhead structural system.

1.3 DEFINITIONS

A. STC: Sound Transmission Class.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For operable glass-panel partitions.

1. Include plans, elevations, sections, details, numbered panel installation sequence, and attachments to other work.
2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.

C. Samples for Verification: For each type of exposed material, finish, covering, or facing, prepared on Samples of size indicated below:

1. Panel Edge Material: Not less than 3 inches (75 mm) long.
2. Glass: Units 12 inches (300 mm) square.
3. Hardware: One of each exposed door-operating device.

D. Delegated-Design Submittal: For operable glass-panel partitions.

1. Include design calculations for seismic restraints.

E. 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. Partition track, track supports and bracing, switches, turning space, and storage layout.
2. Suspended ceiling components.
3. Structural members to which suspension systems are attached.
4. Size and location of initial access modules for acoustical tile.

F. Setting Drawings: For embedded items and cutouts required in other work, including support-beam, mounting-hole template.

G. Seismic Qualification Certificates: For operable glass-panel partitions, tracks, accessories, and components, from manufacturer. Include seismic capacity of partition assemblies to remain in vertical position during a seismic event and the following:

1. Basis for Certification: Indicate whether certification is based on analysis, testing, or experience data, according to ASCE/SEI 7.
2. Detailed description of partition anchorage devices on which the certification is based and their installation requirements.

H. Sample Warranty: For manufacturer's special warranty.

I. Operation and Maintenance Data: For operable glass-panel partitions to include in maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Panel finish and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
b. Seals, hardware, track, track switches, carriers, and other operating components.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of operable glass-panel partitions that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of operable glass-panel partitions.
b. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic bracing of tracks to structure above.

B. Seismic Performance: Operable glass-panel partitions shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the partition panels will remain in place without separation of any parts from the system when subjected to the seismic forces specified."

C. Acoustical Performance: Provide operable glass-panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:

1. Sound-Transmission Requirements: Operable glass-panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.

D. Fire-Test-Response Characteristics: Provide wood-framed panels complying with one of the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

2.2 OPERABLE GLASS PANELS

A. Operable Glass Panels: Wood-framed glass-panel partition system, including panels, seals, suspension system, operators, and accessories.

1. Manufacturers: Subject to compliance with requirements, provide products the following:

a. NanaWall Systems, Inc. WD66 -- The Standard Wood Framed Folding System

B. Panel Operation: Manually operated, continuously hinged panels.

C. Panel Construction: As required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.

1. Factory-Glazed Fabrication: Glaze operable glass panels in the factory where practical and possible for applications indicated. Comply with manufacturer's written instructions and with requirements in Section 088000 "Glazing."

D. Glass and Glazing: Provide manufacturers double glazed, clear, insulated tempered glazing.

E. Dimensions: Fabricate operable glass-panel partitions to form an assembled system of dimensions indicated and verified by field measurements.

1. Panel Width: Equal widths as indicated in drawings.
2. Bottom rail of windows to be 10” height.

F. STC: Not less than 36.

G. Panel Weight: 6 lb/sq. ft. (29.3 kg/sq. m) maximum.

H. Panel Frame Thickness: Maximum 1-7/8 inches (48 mm).

I. Panel Frame Materials:

1. Wood Frame: Clear, vertical-grain, straight, kiln-dried, fire-retardant-treated wood as follows:

a. Species: European Oak (Oak 100).

J. Panel Closure: Manufacturer's standard unless otherwise indicated.

K. Hardware: Manufacturer's standard as required to operate operable glass-panel partition and accessories; with decorative, protective finish.

1. Mounting: Top Hung.
2. Hinges: Concealed (invisible).
3. Floor Lock: Thumb-turn actuated.
4. Swing and Stacking: Inward.

L. Floor Sill Type: **Flush (requires recessed installation).**

M. Panel Frame Finishes:

1. Wood Finish: Match Architect's sample, as follows:

a. Type: Transparent finish over stain over wood variety indicated.

2.3 SEALS

A. General: Provide seals that produce operable glass-panel partitions complying with performance requirements and the following:

1. Manufacturer's standard seals unless otherwise indicated.
2. Seals made from materials and in profiles that minimize sound leakage.
3. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable glass-panel partition perimeter and adjacent surfaces, when operable glass-panel partition is extended and closed.

2.4 SUSPENSION SYSTEMS

A. Tracks: Steel or aluminum with adjustable steel hanger rods for overhead support, designed for operation, size, and weight of operable glass-panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable glass-panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch (2.54 mm) between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.

1. Panel Guide: Aluminum guide on both sides of the track to facilitate straightening of the panels; finished with factory-applied, decorative, protective finish.

2. Head Closure Trim: As required for acoustical performance; primed for field finish.

B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.

1. Multidirectional Carriers: Capable of negotiating intersections without track switches.

C. Aluminum Finish: **Match Aluminum Storefront Systems color.**

D. Steel Finish: Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable glass-panel partitions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with ASTM E 557 except as otherwise required by operable glass-panel partition manufacturer's written installation instructions.

B. Install operable glass-panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.

C. Install panels from marked packages in numbered sequence indicated on Shop Drawings.

D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

E. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

F. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and bottom seals for voids. Adjust partitions for alignment and full closure of vertical joints and full closure along top and bottom seals.

3.3 ADJUSTING

A. Adjust operable glass-panel partitions, hardware, and other moving parts to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust storage pocket doors to operate smoothly and easily, without binding or warping.

C. Verify that safety devices are properly functioning.

3.4 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include quarterly

preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operable-partition operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable glass-panel partitions.

END OF SECTION 102238

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
1. Corner guards.
2. Stainless steel wainscot at mop basins.
3. Impact-resistant wall coverings.

B. See Division 8 Section "Door Hardware" for metal armor, kick, mop, and push plates.

1.3 SUBMITTALS

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

B. Shop Drawings: Include sections, details, and attachments to other work.

C. Samples: For each type of unit and for each color and texture required.

D. Maintenance data.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall-protection units that fail in materials or workmanship within specified warranty period.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide impact-resistant wall protection system products by one of the following:
1. Arden Architectural Specialties, Inc.
2. Balco, Inc.
3. Construction Specialties, Inc.
4. IPC Door and Wall Protection Systems, Inc.
5. Koroseal Wall Protection Systems, Inc.
6. Pawling Corporation.

7. Tri-Guards, Inc.

2.2 MATERIALS

A. PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; sheet material, thickness as indicated.

1. Impact Resistance: Minimum 25.4 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
2. Chemical and Stain Resistance: Tested according to ASTM D 543.
3. Self-extinguishing when tested according to ASTM D 635.
4. Flame-Spread Index: 25 or less.
5. Smoke-Developed Index: 450 or less.
6. Color: As selected from the manufacturers full range of colors.

B. Stainless-Steel Plate: Type 304, minimum 0.0625 inch.

C. Fasteners: Provide nonmagnetic stainless-steel, or other non-corrosive metal screws, bolts, and other fasteners compatible with components, hardware, anchors, and other items being fastened. Use theft-proof fasteners where exposed to view.

2.3 CORNER GUARDS

A. Surface-Mounted, Metal Corner Guards: Fabricated from 1-piece, formed metal with formed edges, with 90-degree or other turn to match wall condition.

B. Provide on all corners where designated in the drawings.
1. Basis-of-Design Product: Model CO-8 stainless steel corner guard by Construction Specialties, Inc. or a comparable product by ARDEN Architectural Specialties, Inc.
2. Material: Stainless steel, Type 304.
   a. Thickness: Minimum 0.0500 inch (16 gage).
   b. Finish: Directional satin, No. 4.
3. Wing Size: Nominal 2 inch by 2 inch.
4. Corner Radius: 1/8 inch.
5. Length: 48 inches.
6. Mounting: Adhesive.

2.4 IMPACT-RESISTANT WALL COVERINGS

A. Impact-Resistant Sheet Wall Covering: Fabricated from plastic sheet wall-covering material.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Floor Products Co., Inc.
   b. Arden Architectural Specialties, Inc.
   c. Balco, Inc.
   d. Construction Specialties, Inc.
   e. IPC Door and Wall Protection Systems; Division of InPro Corporation.
   f. Pawling Corporation.
   g. WallGuard.com.

2. Size: 48” wide.
3. Sheet Thickness: 0.060 inch.
4. Color and Texture: As selected by Architect from manufacturer's full range.

5. Height: Full wall.
6. Trim and Joint Moldings: Extruded rigid plastic that matches sheet wall covering color.
7. Mounting: Adhesive.

2.5 MOP SINK WALL PROTECYION

A. Stainless-Steel Sheet: ASTM A 240. Size to width of sink and 28” above sink.

B. Adhesive: Type recommended by manufacturer for use with material being adhered to substrate indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine walls to which impact-resistant 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 impact-resistant wall protection units attached with adhesive or foam tape, 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.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. Install Impact-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

B. Install impact-resistant corner guard units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, stains, or other defects that might be visible in the finished Work.

C. Install wall-protection of mop sinks level, plumb and true to the sink unit and corner as possible.

D. Immediately after completion of installation, clean corner guards using a standard, ammonia-based, household cleaning agent.

E. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Toilet and bath accessories.

B. Related Sections include the following:

1. Division 10 Section "Toilet Compartments" for compartments and screens.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.

1. Products of other manufacturers with equal characteristics, as judged solely by Architect, may be provided.
2. Products of other manufacturers listed in Part 2 with equal characteristics, as judged solely by Architect, may be provided.
3. Other manufacturers' products with equal characteristics may be considered. See Division 1 Section "Substitutions."
4. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.7 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.8 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Provide products manufactured by Bobrick Washroom Equipment, Inc., no substitutions allowed.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Galvanized Steel Sheet: ASTM A 653/A 653M, G60.

C. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.

D. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.

E. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.

F. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

G. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

A. General: One, maximum 1-1/2-inch- diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.

D. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.

1. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

E. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:

1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

F. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights in accordance with manufacturer’s standard mounting heights.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

C. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturers written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

A. Hook:

1. Products: Provide Bradley #9114.

B. Soap Dispenser:

1. Product: Provided #6315, Sensor operated soap dispenser, counter mounted.

C. Paper Towel Dispenser:

1. Product: Provided by Owner, installed by Contractor.

D. Toilet Tissue Dispenser:

1. Product: Provided by Owner, installed by Contractor.

E. Grab Bar:

1. Product: Provide Bradley 800 Series (concealed fasteners) x 42 inch (length as indicated on drawings)

F. Grab Bar:

1. Product: Provide Bradley 800 Series (concealed fasteners) - 36 inch (length as indicated on drawings)

G. Mop and Broom Holder:

1. Products: Provide Bradley #9963.

H. Sanitary Napkin Disposal Unit:

1. Products: Provide Bradley #4721-15 between partitions and recessed #4731-15 for walls.

I. Electric Hand Dryer:

1. Products: Provide Dyson Airblade, Silver Color.

J. Under-lavatory Guard:

1. Product: Truebro Series #100 for tubular P-traps or Series #400 for schedule 40 ABS or PVC P-traps

K. Mirror, framed:

1. Product: Bradley #781.

L. Baby Changing Station:

1. Product: Bradley #9612.

END OF SECTION 102800

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes manufactured fireplaces.

B. Related Sections include the following:

1. Division 7 Section “Joint Sealants” for sealants installed in perimeter joints between fireplace and adjoining construction
2. See Division 15 Sections for ductwork and gas connections to fireplace.
3. See Division 16 Sections for electrical power connections for fireplace.

1.2 SUBMITTALS

A. Product Data: For each type of product specified. Indicate compliance with requirements, installation instructions, and complete operating and maintenance instructions for each appliance.

B. Shop Drawings: Show plans, elevations, sections, and details showing profiles of fireplace; unit dimensions related to wall openings and construction; free areas for each size indicated; profiles of frames at jambs, heads, and sills; and anchorage details and locations.

C. Wiring Diagrams: Detail power, signal, and control systems, clearly differentiating between manufacturer-installed wiring and field-installed wiring.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for factory-applied color finishes.

E. Product Test Reports: Indicate compliance with performance requirements indicated.

1.3 QUALITY ASSURANCE

A. UL and NEMA Compliance: Provide motors and related electrical components that are listed and labeled by UL and comply with applicable NEMA standards.

B. AGA and ANSI Standards: Provide gas-burning appliances that carry the design certification seal of the American Gas Association (AGA) and comply with ANSI Z21-Series standards.

C. Single-Source Responsibility: Obtain fireplace and vents from one source and by a single manufacturer where alike in one or more respects regarding type, design, and factory-applied color finish.

D. Welding Standards: Comply with applicable provisions of D1.2 "Structural Welding Code--Aluminum," and D1.3 "Structural Welding Code--Sheet Steel."

E. SMACNA Standard: Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.

1.4 DELIVERY AND STORAGE

A. Deliver fireplace to the Project site in the manufacturer's undamaged protective packaging.

B. Delay delivery of fireplace until utility rough-in is complete and construction in the spaces to receive fireplace is substantially complete and ready for installation.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify manufactured fireplace dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening and wall dimensions and note on Shop Drawings that these are not measured dimensions. Proceed with fabricating manufactured fireplace without field measurements. Coordinate wall, floor, and ceiling construction to ensure that actual opening dimensions correspond to established dimensions.

1.6 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of manufactured fireplace that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Four (4) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIRECT VENT GAS FIREPLACE

B. Product: Basis of Design: Majestic Fireplaces, Div. of CFM Specialty Home Products; Echelon Direct Vent Gas Model See-Thru Unit.

1. Acceptable Manufacturers:

a. Majestic Fireplaces.
b. Art of Fireplaces; Montigo C-920-ST.

2.2 MATERIALS

A. Galvanized-Steel Sheet: ASTM A 526 or ASTM A 527, G90 zinc coating, mill phosphatized.

B. Fasteners: Of same basic metal and alloy as fastened metal or 300 series stainless steel, unless otherwise indicated. Do not use metals that are corrosive or incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.

C. Anchors and Inserts: Of type, size, and material required for type of loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

D. Glass: Size – refer to drawings.

E. Glass Type: Minimum of 5 mm Tempered Glass.

2.3 FABRICATION

A. Fabricate fireplace and vents to comply with requirements indicated for design, dimensions, materials, joinery, and performance.

B. Assemble fireplace in shop to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Fabricate fireplace to fit in opening of sizes indicated, with allowances made for fabrication and installation tolerances of fireplace, adjoining construction, and perimeter sealant joints.

D. Include supports, anchorages, and accessories required for complete assembly.

2.4 ACCESSORIES

A. Gas Bar: Provide vent-free, heat-producing gas bars which burns at 99.9 percent efficiency and delivers up to 60,000 Btu/hr. of beneficial heat.

1. Certification: American Gas Association, certified for use in any approved solid-fuel burning fireplace.
2. Material: High temperature refractory material with poly-fiber “needles” and accurately sized reinforcement rods for added strength and durability.
3. Pilot: Natural gas, with standing pilot with matchless push-twist piezo igniter for quick start.

B. Hood: Provide black coordinating heat diverter hood.

C. Front: RF Reflection-Free glass; single fixed panel to prevent unauthorized access to gas log assembly and firebox.

D. Andirons: Cast iron.

2.5 FINISHES

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Finish: Provide manufacturer’s standard black finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION

A. Locate and place fireplace plumb, level, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding operations required for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items that cannot be refinished in the field to the shop, make required alterations, and refinish entire unit, or provide new units.

F. Protect galvanized- and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

3.3 ADJUSTING AND PROTECTION

A. Protect fireplace from damage of any kind during construction period including use of temporary protective coverings where needed and approved by manufacturer. Remove protective covering at time of Substantial Completion.

B. Restore fireplace damaged during installation and construction period, so that no evidence remains of correction work. If results of restoration are unsuccessful, as judged by Architect, remove damaged units and replace with new units.

1. Clean and touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

C. Test operation of adjustable wall fireplace and adjust as needed to produce fully functioning units that comply with requirements.

D. Do not burn wood or other materials in these appliances.

3.4 CLEANING

A. Periodically clean exposed surfaces of fireplace that are not protected by temporary covering to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Rinse surfaces thoroughly and dry.

END OF SECTION 103100

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Fire protection cabinets for the following:

a. Portable fire extinguishers.

B. Related Sections:

1. Division 10 Section "Fire Extinguishers."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.

1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
2. Show location of knockouts for hose valves.

B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: For each type of fire protection cabinet indicated.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Size: 6 by 6 inches square.

E. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function.

F. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

B. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to fire protection cabinets including, but not limited to, the following:

a. Schedules and coordination requirements.

1.5 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.

1.6 SEQUENCING

A. Apply decals on field-painted, fire protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B.

B. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.2 FIRE PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Products: Subject to compliance with requirements, provide products by one of the following:

a. J. L. Industries, Inc., a division of Activar Construction Products Group.
b. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
c. Larsen's Manufacturing Company.
d. Potter Roemer LLC.
e. Watrous Division, American Specialties, Inc.

B. Cabinet Construction: Nonrated except where installed in fire-rated walls.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material. Provide factory-drilled mounting holes.

a. Provide cabinets with fire rating equivalent to fire rating of host wall.

C. Cabinet Material: Steel sheet.

1. Shelf: Same metal and finish as cabinet.

D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.

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.

1. Provide recessed door pull and friction latch.
2. Provide concealed hinge permitting door to open 180 degrees.

J. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate 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) Lettering Color: Red.
4) Orientation: Vertical.

K. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:

a. Exterior of cabinet, door, and trim except for those surfaces indicated to receive another finish.
b. Interior of cabinet and door.

2. Steel: Baked enamel or powder coat.

2.3 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames of one-piece construction with edges flanged.
2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish fire protection cabinets after assembly.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning". After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semirecessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

1. Fire Protection Cabinets: 54 inches above finished floor to top of cabinet.

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire protection cabinets.
2. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.
3. Fire-Rated, Cabinets:

a. Install cabinet with not more than 1/16-inch tolerance between pipe OD and knockout OD. Center pipe within knockout.

b. Seal through penetrations with firestopping sealant as specified in Division 7 Section "Penetration Firestopping."

C. Identification: Apply decals at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Sections:

1. Division 10 Section "Fire Extinguisher Cabinets."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function.

C. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

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.

1. Provide fire extinguishers approved, listed, and labeled by FMG.

C. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:

a. Schedules and coordination requirements.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Failure of hydrostatic test according to NFPA 10.
   b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 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. J. L. Industries, Inc.; a division of Activar Construction Products Group.
   b. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
   c. Larsen's Manufacturing Company.
   d. Potter Roemer LLC.

2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. 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 Aluminum Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-aluminum container.

2.2 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard 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, provide products by one of the following:

   a. J. L. Industries, Inc.; a division of Activar Construction Products Group.
   b. Larsen's Manufacturing Company.
   c. 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

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDED

A. Supply and installation of:

1. Automatic Vertically Folding Acoustical Wall(s) as shown on the architectural drawings. All necessary hardware, seals, lifting machinery, electrical controls are included.

1.3 RELATED WORK

A. The main support steel beam for the wall as well as the miscellaneous support steel for the lifting machinery for the Automatic Vertically Folding Acoustical Wall – Section.

B. Ceiling storage pockets along axis of Automatic Vertically Folding Acoustical Wall – Section . Bulkheads and sound insulation above, below and in the fixed walls at both ends of the Automatic Vertically Folding Acoustical Wall, as per ASTME557 -77 (Re-approved 1990) – Section.

C. All site wiring and connections for main power, including disconnect switches at each motor location. All site wiring and connections for control, including installation of key switches – Section.

1.4 SYSTEM DESCRIPTION

A. Definition

1. Automatic Vertically folding Acoustical Wall (from here on called Operable Wall) shall refer specifically to acoustical partitions that, when in the down position (closed) are hard, rigid, flat, plumb walls, made of a grid of rectangular acoustical panels, and when are lifted (opened), fold upward (vertically) without the use of any manual labour, in a manner similar to an accordion, into a pocket in the ceiling, between roof joists, or up between built in bulkheads. In the down (closed) position, the wall shall be comprised of two vertical planes of acoustical panels, separated by an acoustical air space.

B. The operable wall shall open and close in a manner similar to an accordion, in that all wall panels fold and unfold at the exact same time, at the exact same rate. Walls that rely on the sequential folding of acoustical panels, or acoustical panel sets are not acceptable.

C. Remote Drive System

1. The motor/shaft/drum assembly is off-set from the centre line of the operable wall. The required distance depends upon the height of the wall. Support steel is required at two locations. The restriction for this operable wall is a maximum 30’-0” (9145mm) finished ceiling height.
2. The operable wall shall be opened and closed using a spring return, 3 position key switch. Turning the key from the “off” position shall cause the wall to move in the designated direction “up” or “down”. When hand pressure is removed, the wall shall immediately stop. The operable wall shall stop in a quick and positive fashion without coasting. As a normal part of the operation, it shall be possible to partially open (or close) the wall, stop it and then reverse the operation. There shall be 2 key switches per operable wall, on either side of the axis of the wall.

3. From a fully open position, the wall shall be able to go through its entire cycle of closing and/or opening without any manual intervention.
4. When the operable wall is being lowered (closed) it shall come automatically to rest once it has reached the fully down (closed) position.
5. When the operable wall is being lifted (opened) it shall come automatically to rest once it has reached the fully up (open) position.
6. The operable wall shall automatically and acoustically seal against the floor without the need for any manual intervention. The floor seals shall leave a joint between the floor and the bottom acoustical panels of not more than approximately 1 ¾" (45mm).
7. The operable wall shall automatically and acoustically seal against the two end walls without the need of any manual intervention. The end seals shall act in such a way as not to come into contact with the end walls while the operable wall is in motion. The end seals shall leave a joint between the acoustical panels and the end walls of no more than approximately 1" (25mm). Seals that rub or brush against the end walls are not acceptable. Once the wall reaches the fully down position, the end seals shall activate automatically. The key switch must be held for the duration of the operation.
8. The operable wall shall automatically and acoustically seal against the ceiling without any manual intervention. The top seals shall leave a joint between the top acoustical panels and the ceiling of the pocket of not more than approximately 1 ¾" (45mm).
9. The operable wall shall open and close at a constant nominal speed of approximately 5 to 10 vertical feet per minute (1.5. to 3 metres per minute).
10. When the operable wall is being lowered (closed), it shall stop if the leading (bottom) edge comes into firm contact with any object between it and the floor. The regular operation of the wall shall resume once the key switch has been released and the direction of the wall has been reversed and the obstruction removed.
11. The operable wall shall be visibly flat and rigid in the down (closed) position.
12. There shall be no exposed hinges, brackets, screws, and no part of the mechanical system shall be visible when the operable wall is in the down (closed) position.
13. All of the panel edges shall be right angled, with a minimum radius not more than 1/16" (1.6mm).
14. All of the panels shall be rectangular, nominally of the same size, unless requested otherwise by the architect.
15. Joints between panel, vertical and horizontal, shall be no more than approximately ½" (12.7mm) wide.
16. For operable walls between 24'-0" (7.315m) and 35'-0" (10.67m) to the beam, the operable wall shall stack in the up (open) position into a space no greater than 65" (1.65m) wide. The operable wall shall have a stacking height ratio in the range of 1:5 to 1:10, depending on the height of the wall.
17. Each acoustical panel shall be individually removable using only a screw driver. No special tools or equipment shall be required. The removal of a single acoustical panel shall not affect, dislocate or cause the removal of any adjacent panels or other acoustical panels.
18. The operable wall shall be mechanically operable with a few of the acoustical panels removed from one, or both sides of the operable wall.
19. The operable wall shall not weigh more than 8 lbs per square foot (39.1 Kg per square metre), not including the lifting equipment and the architectural finish on the acoustical panels.
20. A completely functioning operable wall, tested in full accordance and compliance with ASTM
21. E90-90 shall achieve a Laboratory Sound Transmission Class all (STC) rating of not less than 51.
22. The operable wall shall be designed to have a design life of at least 10,000 complete closed to opened to closed cycles.

1.5 QUALITY ASSURANCE

A. The products herein specified established the standard of quality for the Automatic Vertically Folding Acoustical Walls based on Skyfold Autolift Wall Systems by Railtech Ltd. of Baie d'Urfe (Montréal), Québec, Canada. Proposals for substitution of products or techniques not conforming to these specifications must be submitted at least ten (10) days prior to bidding. Independent test reports which meet the requirements and design specified herein must be submitted to obtain approval.

B. All work and materials specified herein, shall be installed only by qualified representatives and/or installers and/or distributors of the manufacturer, according to the manufacturers written instructions.

C. The operable wall must be manufactured by a certified ISO-9001-2000 company or an equivalent quality control system.

1.6 REFERENCES

1. ASTM E90-90, Method For Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
2. ASTM E413-87, Classification For Rating Sound Insulation.
3. ASTM E557-77 (Re-approved 1990), Standard Practice For Architectural Application and Insulation of Operable Partitions.

1.7 SUBMITTALS

A. Submit manufacturers technical data for each type of operable wall specified herein.

B. Submit shop drawings showing complete layout of operable wall system based on field verified dimensions. The drawings shall include dimensional relationship to adjoining work. Include details indicating materials, finishes, tolerances, methods of attachment to building steel and electrical requirements.

C. Submit certified test reports evidencing compliance to acoustical STC requirements as specified herein**.**

1.8 SITE CONDITIONS

A. The floor underneath the operable wall along its axis, shall be flat to within +/- ¼” (6 mm) over the entire length of an operable wall. The peak to valley undulation of +/- ¼” (6 mm) shall not be closer together than 24” (610 mm) and a peak to valley undulation of +/- 1/8” (3 mm) shall not be closer than 12” (305 mm).

B. Support steel above the operable wall along its axis shall be parallel to the floor within +/-½” (12.7 mm) for the entire length of the operable wall. This includes loaded deflection. The beam must also be paralled to the centre line of the wall within + 1/8” (3 mm), left to right.

C. The fixed walls at either end of the operable wall shall be within +1/4” (6 mm)-0, from plumb vertical.

D. The fixed walls at either end of the operable wall shall be flat to within +0, -1/4” (6 mm).

1.9 WARRANTY

A. The operable wall shall be warranted free from defects in material and workmanship for a period of two years or five thousand cycles and the parts only will be free from defect for a period of ten years or five thousand cycles, whichever occurs first from date of shipment.

B. Parts and labour required to maintain the operable wall and part subject to normal wear and tear are not covered under the warranty and are the owner’s responsibility. (Refer to Maintenance Program).

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Skyfold Autolift Wall System as manufactured by Railtech Ltd. of Baie d'Urfe (Montréal), Québec, Canada and Railtech Composites, Inc. Plattsburg, New York.

2.2 MATERIALS

A. Acoustical Panels

1. Acoustical panels shall be faced with steel that is compatible with a wide variety of architectural finishes such as paint, vinyl, wall paper, etc.
2. Acoustical panels, together with all of the sound insulation, shall be, as much as possible, made of non-combustible or fire treated materials.
3. Acoustical panels shall be fabricated to be as stiff as possible in order to satisfy the rigid criteria when the operable wall is down (closed) and to ensure that there is no interference between panels when the wall is in motion.

B. Acoustical panels shall be architecturally flat with no bowing, oil canning, warping, waviness or any other surface deformation and discontinuity.

C. Acoustical panels shall have the finish of the architects choice, provided that the finish has been approved by the operable wall manufacturer to ensure compatibility with the wall panels. The following criteria must be met:

1. Maximum weight of material: .111 lbs/ft²
2. Maximum thickness of material: 1/8"
3. No brittle materials.

2.3 FOLDING MECHANISM

A. The hanging, folding and extension mechanism shall be, as much as possible, made from structural grade aluminum extrusions and structural shapes, in order to minimize the weight of the system.

B. All wear surfaces, such as bushings, spacers, pins, discs, bearings, sleeves shall be designed to function quietly and with minimum wear, over the 10,000 cycle design life of the operable wall.

C. The hangers, which fasten the lifting mechanism to the support steel, shall be fabricated from steel and shall be welded or bolted to the support steel supplied by others.

2.4 LIFTING EQUIPMENT

A. The lifting equipment shall be sized properly so that it can open and close the wall effectively over the 10,000 cycle design life of the wall, at the minimum design speed specified in point 1.3.2.8.

B. The lifting mechanism shall be designed to function as smoothly, quietly and safely as possible. Wherever possible, ball bearings shall be used instead of bushings and wear surfaces. In no circumstance shall chain or belt drive systems be acceptable.

C. There shall be a wire rope cable for every set of lifting mechanisms. This cable shall be of 6 x 31 construction aircraft cable and shall be made of galvanized steel. The diameter of the cables shall be sized so that they shall be able to hold the entire weight of the wall, with the appropriate safety factor.

D. For the remote drive system, each wire rope cable shall wind and unwind on its own cable drum. The cable drums shall be grooved to accept a single layer of cable and shall have a minimum pitch diameter of 20 times the cable diameter. Length of drums shall be sufficient to accommodate 3 cable safety wraps. Cable drums shall be keyed to the line shaft. For the compact drive system, the cable wraps on yoyo drums with 2 safety wraps and multiple layers of cable.

E. The line shaft, sized to deliver the required torque with minimum deflection, shall support and rotate the cable drums.

F. Pillow block bearings (for the remote drive system), of appropriate size, support the line shaft and shall be located immediately on either side of each cable drum. Flange bearings shall be used for the compact drive system, located immediately on both sides of the drum assembly.

G. For the remote drive system, the line shaft shall be connected directly to the power drive through properly sized, load rated couplings, keyed to the line shaft.

H. The power drive shall be sized to deliver sufficient amount of torque to safely and effectively raise and lower the operable wall over its design life.

I. The lifting equipment shall use the latest in industry standards in thermal protection, overload protection, quick acting fuses, etc., in order to ensure the safety and reliability of the system.

2.5 SAFETY EQUIPMENT

A. The operable wall shall employ an electromagnetic type of brake which shall activate firmly, without hesitation, when power is lost to the system. This brake shall have a minimum retarding torque rating equal to 200% of the power drive full load torque. A manual break release lever is supplied on the motor.

B. The operable wall shall employ a dynamic brake, distinct and separate from the brake in 2.2.4.1, in order to lower the wall at a controlled speed of no more than approximately 150% of the normal down speed, in the case of a catastrophic failure in the power train. Alternately, the operable wall shall employ a brake, distinct and separate from the brake in 2.2.4.1, in order to completely halt the downward motion of the wall in the case of a catastrophic failure in the power train.

C. The operable wall shall employ electrical or other limit switches in order to stop the wall at its up and down travel limits.

D. The operable wall shall employ an over torque detector in order to sense a jam in the system and to act as an over travel limit in the up direction should the primary limit switch fail to act in 1.3.2.4. This over torque sensor shall be mechanical, using the motor's torque arm in its over torque detection.

E. The entire length of the bottom edge of the operable wall shall be equipped with a continuous pressure sensing strip which shall cut power to the lifting equipment and shall activate the brake outlined in 2.2.4.1, if the sensing edge comes in firm contact with an object, before the wall is in the full down (closed) position. The power shall remain cut to the lifting equipment until the key switch has been released or the direction of the wall has been reversed and the obstruction is removed.

2.6 FABRICATION

A. Factory assemble all components, assemblies and systems into the largest possible assemblies in order to minimize the amount of assembly on site.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect the relevant aspects of the site such as the evenness of the floor, walls, structural steel, etc., and ensure that these are within the tolerances stated in Part – 1 of this specification.

B. Confirm in writing to the General Contractor or contract manager any deviations from these tolerances. Do not proceed until these conditions are made good.

C. Carry out all appropriate field measurements before manufacturing any components or assemblies.

3.2 INSTALLATION

A. Install operable walls in accordance with the manufacturer's printed instructions.

1. The operable wall supplier shall not deliver or install this product until the General Contractor can ensure in writing safe storage and protection for the wall for the duration of the project.

3.3 ADJUSTING AND CLEANING

A. Adjust and fine-tune the operable walls to ensure that all seals are operating and sealing properly and that the walls are in correct and smooth operation.

B. Clean up any dirt, oil, grime, etc., that may have found its way onto the acoustical panels. Leave the wall in a state of architectural cleanliness.

3.4 SPARE PARTS

A. Ensure the correct number of spare parts that were requested are safely stored in secure areas designated by the architect or owner.

END OF SECTION 106500

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Front-projection screens.

B. Related Sections include the following:

1. Division 6 Section "Miscellaneous Rough Carpentry" for wood backing for recessed screen installation.
2. Division 16 Sections for electrical wiring, connections, and installation of remote-control switches for electrically operated projection screens.

1.3 DEFINITIONS

A. Gain: Ratio of light reflected from or refracted by screen material to that reflected perpendicularly from a magnesium carbonate surface as determined per FS GG-S-00172D(1).

B. Half-Gain Angle: The angle, measured from the axis of the screen surface, to the most central position on perpendicular plane through the horizontal centerline of the screen where the gain is half of the peak gain.

1.4 ACTION SUBMITTALS

A. Product Data: For each screen indicated.

B. Shop Drawings: For projection screens. Show layouts and types of projection screens. Include the following:

1. For electrically operated projection screens and controls:

a. Location of screen centerline relative to ends of screen case.
b. Location of wiring connections for electrically operated units.
c. Location of seams in viewing surfaces.
d. Drop lengths.
e. Anchorage details, including connection to supporting structure for suspended units.
f. Details of juncture of exposed surfaces with adjacent finishes.
g. Accessories.
h. Wiring diagrams.

C. Samples for Initial Selection: For finishes of surface-mounted screen cases.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For projection screens to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain projection screens through one source from a single manufacturer. Obtain each screen as a complete unit, including necessary mounting hardware and accessories.

B. Coordination of Work: Coordinate layout and installation of projection screens with other construction supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system, and partitions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver projection screens until building is enclosed, other construction within spaces where screens will be installed is substantially complete, and installation of screens is ready to begin.

B. Store rear-projection screens as recommended in manufacturer's written instructions and in manufacturer's protective packages until time of installation.

C. Protect surfaces of rear-projection screens from damage due to abrasion, dust, and other conditions.

PART 2 - PRODUCTS

2.1 FRONT-PROJECTION SCREENS

A. Material and Viewing Surface of Front-Projection Screens: Provide screens manufactured from mildew- and flame-resistant fabric of type indicated for each type of screen specified and complying with the following requirements:

1. Reflective viewing surface, matte silver, silver lenticular, pearlescent, or high-gain matte neutral, with the following gain characteristics:

    a. Peak gain of 2.5 to 3.2, and half-gain angle of at least 20 degrees.

2. Material: Vinyl-coated glass-fiber fabric.
3. Mildew Resistance: Provide mildew-resistant screen fabrics as determined by FS 191A/5760.
4. Fire-Test-Response Characteristics: Provide projection-screen fabrics identical to materials that have been tested for flame resistance according to both small- and large-scale tests of NFPA 701.
5. Seamless Construction: Provide screens in sizes indicated without seams.
6. Edge Treatment: Black masking borders.
7. Provide extra drop length to comply with the following requirements for fabric color and location of drop length:

    a. Color: White.
    b. Location: At bottom of screen, provide a length of 4’-0”.
    c. Location: At top of screen, provide a length of 10’-0”.

8. Size of Viewing Surface: Minimum diagonal viewing area is to be 250”.
9. Locations: Refer to Drawings.

B. Electrically Operated Screens, General: Provide manufacturer's standard UL-labeled units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Remotely control operation of each screen to comply with the following:

1. Multistation Control (per screen): Low-voltage control system consisting of a **Key-Activated** control unit with 24-V power supply and remote, 3-button or 3-position switches at locations indicated with metal device boxes and cover plates for flush wall mounting.

2. Motor in Roller: Instant-reversing motor of size and capacity recommended by screen manufacturer with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
3. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8-inch-diameter, metal rod with ends of rod protected by plastic caps.

    a. Roller for end-mounted motor supported by self-aligning bearings in brackets.
    b. Roller for motor in roller supported by vibration- and noise-absorbing supports.

C. Electrically Operated Screens with Automatic Bottom Closure: Units designed and fabricated for full surround case with bottom composed of 2 panels fully enclosing screen, motor, and wiring; 1 panel hinged and designed to open and close automatically when screen is lowered and fully raised, and the other panel removable or openable for access to interior of case; and complying with the following requirements:

1. Screen Case with Motor in Roller: Aluminum framing with sides, end, and top panels of fire-retardant hardboard or ABS plastic and with aluminum bottom panels, factory primed and constructed as follows:

    a. Mounting is to be side-mount to wall/bulkhead, above ceiling line.
    b. Entire housing, including bottom closure, is to be painted flat black.

2. Include a RS-232 Serial Communications Control Board.

D. Products: Subject to compliance with requirements, provide screens by one of the following:

1. Electrically Operated Screens with Automatic Ceiling Closure, Motor in Roller:

    a. Da-Lite Screen Co., Inc.
    b. Draper Shade & Screen Co., Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install projection screens at locations indicated to comply with screen manufacturer's written instructions.

B. Install front-projection screens with screen cases in position and relationship to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.

1. Test electrically operated units to verify that screen, controls, limit switches, closure, and other operating components are in optimum functioning condition.
2. Test manually operated units to verify that screen operating components are in optimum functioning condition.

3.2 PROTECTING AND CLEANING

A. Protect projection screens after installation from damage during construction. If damage occurs despite such protection, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.

END OF SECTION 111320

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes manual and electric roller shades.

B. Related Sections include the following:

1. Division 6 Section "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.

1. Provide shop drawings and details that are project specific and indicate adjacent construction.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension system members and attachment to building structure.
2. Ceiling-mounted or penetrating items including light fixtures, air outlets and inlets, speakers, sprinklers, recessed shades, and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
3. Audiovisual equipment coordination.
4. Shade mounting assembly and attachment.
5. Size and location of access to shade operator and adjustable components.
6. Minimum Drawing Scale: 1/4 inch = 1 foot.

D. Samples for Initial Selection: For each colored component of each type of shade indicated.

1. Include similar Samples of accessories involving color selection.

E. Samples for Verification:

1. Complete, full-size operating unit not less than 16 inches wide for each type of roller shade indicated.
2. For the following products:

a. Shade Material: Not less than 3 inches square, with specified treatments applied. Mark face of material.
b. Valance: Full-size unit, not less than 12 inches long.

F. Window Treatment Schedule: For roller shades. Use same designations indicated on Drawings.

G. Product Certificates: For each type of roller shade, signed by product manufacturer.

H. Qualification Data: For Installer.

I. Product Test Reports: For each type of roller shade.

J. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for each type of roller shade.

K. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:

1. Methods for maintaining roller shades and finishes.
2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
3. Operating hardware.
4. Motorized shade operator.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Source Limitations: Obtain roller shades through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Resistance Ratings: Passes NFPA 701.

D. Product Standard: Provide roller shades complying with WCMA A 100.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, lead-free designation, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Rollers Shades: Before installation begins, for each size, color, texture, and pattern indicated, full-size units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 ROLLER SHADES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Basis of Design: Refer to Finish Schedule in the Drawings.

B. Shade Band Material: Fiberglass and acrylic blend, refer to Finish Schedule in the drawings.

C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with manufacturer's standard method for attaching shade material. Provide capacity for one roller shade band(s) per roller, unless otherwise indicated on Drawings.

D. Direction of Roll: Regular, from back of roller.

E. Mounting Brackets: Galvanized or zinc-plated steel.

F. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated on Drawings; removable design for access.

G. Top/Back Cover: L-shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.

H. Pocket with Ceiling Slot Opening: Six-sided box units for recessed installation; fabricated from formed-steel sheet, extruded aluminum, or wood; with a bottom consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or an openable, continuous metal access panel concealing rollers, brackets, and operating hardware and operators within; capacity for one roller shade per pocket, unless otherwise indicated on Drawings.

1. Corner Section: Factory formed and welded.

I. Bottom Bar: Steel or extruded aluminum, with plastic or metal capped ends. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.

J. Audiovisual Light-Blocking Shades: Designed for eliminating all visible light gaps when shades are fully closed; fabricated from blackout shade band material with pocket and bottom bar extended and formed for light-tight joints among shade components and between shade components and adjacent construction.

1. Side Channels, Sill Channel or Angle, and Perimeter Seals: Manufacturer's standard design, including sill light seal attached to bottom bar, for eliminating light gaps when shades are closed.
2. Shade Band Retention System: Manufacturer's standard design for guiding shade band material through range of travel and holding shade band flat with edges of material within side channels.

K. Valance: As indicated by manufacturer's designation for style and color.

L. Mounting: As indicated on Drawings, mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

M. Shade Operation: Manual; with spring roller lift operator.

1. Pull: Manufacturer's standard hand-grip engaged pull and pole, in length required to make operation convenient from floor level, with hook for engaging ring.
2. Position of Clutch Operator: Left side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated on Drawings.
3. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
4. Lift-Assist Mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades.
5. Loop Length: Length required to make operation convenient from floor level.
6. Bead Chain: Nickel-plated metal.
7. Cord Tensioner Mounting: Wall.
8. Crank Handle: Fixed, one per crank.
9. Length of Crank Handle: Manufacturer's standard length.
10. Operating Function: Stop and hold shade at any position in ascending or descending travel.

2.2 MOTORIZED ROLLER SHADE OPERATORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide per Finish Schedule in the drawings.

B. General: Provide factory-assembled motorized shade operation systems designed for lifting shades of type, size, weight, construction, use, and operation frequency indicated. Provide operation systems of size and capacity and with features, characteristics, and accessories suitable for Project conditions and recommended by shade manufacturer, complete with electric motors and factory-prewired motor controls, remote-control stations, remote-control devices, power disconnect switches, enclosures protecting controls and all operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.

C. Comply with NFPA 70.

D. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6 with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

E. Electric Motors: UL-approved or -recognized, totally enclosed, insulated motor, complying with NEMA MG 1, with thermal-overload protection, brake, permanently lubricated bearings, and limit switches; sized by shade manufacturer to start and operate size and weight of shade considering service factor or considering Project's service conditions without exceeding nameplate ratings.

1. Service Factor: According to NEMA MG 1, unless otherwise indicated.
2. Motor Characteristics: Single phase, 110 V, 60 Hz.
3. Motor Mounting: Within manufacturer's standard roller enclosure.

F. Position of Motor and Electrical Connection: Left side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated on Drawings.

G. Remote Controls: Electric controls with NEMA ICS 6, Type 1 enclosure for surface mounting. Provide the following devices for remote-control activation of shades:

1. Control Stations: Keyed, maintained-contact, three-position, switch-operated control station with open, close, and off functions. Provide two keys per station.

H. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop shade at fully raised and fully lowered positions.

I. Operating Function: Stop and hold shade at any position.

J. Operating Features: Include the following:

1. Group switching with integrated switch control; single face plate for multiple switch cut-outs.
2. Capable of interface with audiovisual control system.
3. Override switch.
4. Backup gear and crank operator for manual operation during power failures with detachable handle, manufacturer's standard length.

2.3 ROLLER SHADE FABRICATION

A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.

B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

1. Lifting Mechanism: With permanently lubricated moving parts.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting headbox, roller, and operating hardware and for hardware position and shade mounting method indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

G. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Connections: Connect motorized operators to building electrical system.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 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.

END OF SECTION 122413

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Extent of site furnishings is shown on drawings, and includes the following:
1. Litter Receptacles
2. Bicycle Racks

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified including installation instructions.

C. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 LITTER RECEPTACLES

A. Basis-of-Design Product:

Manufacturer: Forms+Surfaces Inc., 30 Pine Street, Pittsburgh, PA 15223, (800) 451-0410, www.forms-surfaces.com.

'Dispatch' Litter Receptacle:
Material: Cast aluminum construction.
Finish: Slate texture powdercoat.
Color: Selected by Landscape Architect from manufacturer's full standard range.
Style: 45 gallon split-stream litter and recycling with instructional graphics.
Mounting: Surface mounted.
Assembly: Shop assembled.

2.2 BICYCLE RACKS

A. Basis-of-Design Product:

Manufacturer: Forms+Surfaces Inc., 30 Pine Street, Pittsburgh, PA 15223, (800) 451-0410, www.forms-surfaces.com.

'Capitol' Bicycle Rack:
Material: Cast aluminum construction.
Finish: Slate texture powdercoat.
Color: Selected by Landscape Architect from manufacturer's full standard range.

Mounting: Surface mounted.
Assembly: Shop assembled.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify locations of site furnishings. Verify that layout and locations comply with requirements for each type and component of furnishing.

3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written installation instructions for all site furnishings, unless more stringent requirements are indicated. Anchor furnishings securely, positioned at locations and elevations indicated on Shop Drawings.

3.3 INSTALLATION

A. Install all site furnishings according to manufacturer’s instructions. Secure to fasteners, level with surrounding paving and set plumb.

3.4 CLEANING

A. After completing furnishings installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

3.5 PROTECTION

A. Protect finishes of all site furnishings from damage during construction period with temporary protective coverings approved by manufacturer. Remove protective covering at the time of Substantial Completion.

END OF SECTION 129300