Pompano Beach City Hall & Parking Deck

Project Manual

Volume 1

Prepared for

RocaPoint Partners and City of Pompano Beach

DESIGN DEVELOPMENT
MARCH 09, 2026

Hellmuth, Obata & Kassabaum, Inc.
124 Giralda Avenue, Suite 100
Coral Gables, FL 33134

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O **Owner: RP Pompano, LLC**
A **Architect:** HOK
C **Civil Engineer and Landscape Architect:** Moore Bass Consulting, Inc.
LA **Landscape Architect:** HOK
S **Structural Engineer:** HOK
FP **Fire Protection Engineer:** Hammond & Associates, Inc.
P **Plumbing Engineer:** HOK
M **Mechanical Engineer:** Hammond & Associates, Inc.
E **Electrical Engineer:** HOK
VT **Vertical Transportation Consultant:** VDA
PAR **Parking Consultant:** THA Consulting Inc.

NOTES:
1. Responsibility is noted for entire Division, if all the sections within Division are authored by the same firm, and for individual sections within a Division, if different firms prepared them.
2. Sections are dated with submission's issue date in the page header, unless otherwise noted.

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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Future work not part of this Project.
5. Owner's product purchase contracts.
6. Owner-furnished/ Contractor-installed (OFCI) products.
7. Owner-furnished/Owner Installed (OFOI) products.
8. Contractor's use of site and premises.
9. Coordination with occupants.
10. Work restrictions.
11. Special security requirements.
12. Specification and Drawing conventions.
13. Miscellaneous provisions.
14. Mechanical and electrical requirements of general work.
15. Permits and Responsibilities

C. Related Requirements:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
2. Division 01 Section “Temporary Tree and Plant Protection.”
3. Division 01 Section “Execution" for coordination of Owner-installed products.

1.2 DEFINITIONS

A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.3 PROJECT INFORMATION

A. Project Identification: Project No. 24.74026 – Pompano Beach City Hall & Parking Deck.

1. Project Location: 125 Dixie Highway, Pompano Beach, FL 33060.

B. Owner:

RocaPoint Partners
309 East Paces Ferry Road
Suite 825
Atlanta, GA 30305

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Owner Contacts:
Matthew Phillips, Owner/Operator

C. City of Pompano Beach's Representative:

Suzette Sibble, Assistant City Manager

D. Architect:

Hellmuth Obata + Kassabaum
124 Giralda Avenue
Suite 100
Coral Gables, FL 33134

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

1. Structural Engineer:

Hellmuth Obata + Kassabaum
1175 Peachtree Street NE
Suite 300
Atlanta, GA 30361

2. Civil Engineer:

George & Associates Consulting Engineers, Inc.
1967 Commonwealth Lane
Suite 200
Tallahassee, FL 32303

3. Landscape Architect:

Conner Landscape Architects
14502 North Dale Mabry Highway
Suite 308
Tampa, FL 33618

Murray Design Group, Inc.
2433 Lee Road
Winter Park, FL 32789

4. Fire Protection, Plumbing, Mechanical, and Electrical, Engineers:

Hammond & Associates, Inc.
499 N.W. 70th Avenue,
Suite 215
Plantation, FL 33317

5. Vertical Transportation Consultant:

VDA, Inc.
100West McNab Road
Suite 209

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Pompano Beach, FL 33609

F. Contractor:

Ajax Building Company
1080 Commerce Blvd.
Midway, FL 32343

1.4 WORK COVERED BY CONTRACT DOCUMENTS

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

B. New Pompano Beach City Hall, encompassing approximately 115,000 GSF, with a diverse mix of program elements; public spaces, including commission chamber, city offices, amenity spaces, and building service spaces. Project includes site work and various facility services.

C. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 PHASED CONSTRUCTION

A. Work does not need to be constructed in phases.

1.6 WORK PACKAGES

A. Work will include early release packages for construction. Each package will be a separate drawing set for bid and construction, as follows:

1. ERP-1: Civil Site work.
2. ERP-2: Structural foundation and vertical superstructure.
3. Construction Documents: Consisting of all remaining work for the Project.

1.7 WORK PERFORMED 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.

B. Preceding Work: Owner will perform the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.

1. TBD.

C. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1. TBD.

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D. Subsequent Work: Owner will perform the following additional work at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory work under this Contract.

1. TBD.

1.8 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:

1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
2. Provide for delivery of Owner-furnished products to Project site.
3. Upon delivery, inspect, with Contractor present, delivered items.

    a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.

4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

1.9 CONTRACTOR'S USE OF SITE AND PREMISES

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

B. Limits on Use of Site: Limit use of Project site to work in areas indicated.

1. Limits: Confine construction operations to as indicated on Drawings.
2. 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.

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3. Contractor Parking: Limit vehicle parking for Contractor and construction personnel to locations indicated on the Drawings. Applicable parking fees shall be paid by the Contractor.

    a. Coordinate parking with Owner. Any vehicles parked on site in areas not approved by Owner will be towed.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

D. Condition of Existing Grounds: Maintain portions of existing grounds and landscaping throughout the construction period unless otherwise designated as work and storage areas. Protect existing vegetation as indicated in Division 01 Section "Temporary Tree and Plant Protection." Repair damage caused by construction operations.

1. Where it is necessary for the Contractor to use portions of existing buildings or grounds for operations, such use shall be strictly in accordance with requirements and approval of the Owner's Representative. Contractor shall provide proper and safe access to the Owner occupied areas at all times. Existing grounds damaged during construction shall be restored to original condition.

1.10 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner may occupy portions of the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.
5. For each limited occupancy, Owner agrees to obtain written consent of Contractor, secure endorsement from insurance carriers, and consent of Surety.

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6. Prior to occupying a specific portion of the Work, Owner and Contractor shall make mutually acceptable arrangements for security, protection and insurance for people and property; warranties; and operation, maintenance and payment for utilities and services for each complete area to be occupied.
7. Owner reserves the right to use and occupy in whole or any part of the improvements that have been substantially completed. Use and occupancy by Owner shall not be construed as an acceptance of Work or any part, and any claim which Owner may have against Contractor shall not be deemed to have been waived by occupancy. If limited occupancy increases cost of Work or imposes delay in completion, Contractor shall be entitled to extra compensation, or extension of time, or both, but claims for extra compensation shall be in writing and shall be substantiated with receipted vouchers and other supporting data.
8. Execute Certificate of Substantial Completion for each specific portion of Work prior to Owner occupancy. After Owner occupancy Contractor shall allow access for Owner personnel, access for the public, operation of HVAC, plumbing, and electrical systems for occupied areas, Owner's security and protection of occupied areas, Owner's maintenance of occupied areas, and Owner's insurance for occupied areas.

1.11 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, work on public streets, rights of way, 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 5:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.

1. Weekend Hours: As approved in advance for each anticipated occurrence by Owner.
2. Early Morning Hours: As approved in advance for each anticipated occurrence by Owner.

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

1. Notify Owner not less than two working days in advance of proposed interruptions.
2. Obtain Architect's Construction Manager's Owner's written permission before proceeding with utility and facility services interruptions.

    a. Unless otherwise directed, protect existing water, gas, power and communication systems, sanitary sewer lines, and other surface and subsurface structures and systems, during progress of Work. Should Contractor in performance of Work disturb, disconnect, or damage any of above, expenses arising from disturbance or in replacing or repair shall be borne by Contractor.

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 Architect Construction Manager Owner not less than two working days in advance of proposed disruptive operations.
2. Obtain Architect's Construction Manager's Owner's written permission before proceeding with disruptive operations.
3. Comply with current regulations for noise control for the City of Tallahassee, FL.

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4. Develop a noise mitigation plan for construction prior to the start of work. Post a copy of the plan at the construction site.
5. Noise mitigation plan shall identify how the Contractor shall prevent noises from exceeding ambient sound levels by more than 10 decibels as measured from inside any property or on a public street at least 15 feet from the source.
6. Impulsive sounds which occur abruptly for a short duration are also restricted by code.
7. Noise Control: Perform operations to minimize noise. Perform noise-causing work in less sensitive hours of the day or week as directed by the Owner.

    a. Repetitive, high-level impact noise will be permitted only between the hours of 8:00 am and 6:00 pm. Do not exceed the following dBa limitations:
    Noise Control:

Sound Level in dBa	Time Duration of Impact Noise
70	More than 12 minutes in any hour.
80	More than 3 minutes in any hour.

    b. Provide equipment, sound-deadening devices, and take noise abatement measures that are necessary for compliance.
    c. Maximum permissible construction equipment noise levels at 50 feet (dBa):

EARTHMOVING	dBa
Front Loaders	75
Backhoes	75
Dozers	75
Tractors	75
Scrapers	80
Graders	75
Trucks	75
Pavers, Stationary	80
Pumps	75
Generators	75
Compressors	75

MATERIALS HANDLING	dBa
Concrete Mixers	75
Concrete Pumps	75
Cranes	75
Derricks Impact	75
Pile Drivers	95
Jack Hammers	75
Rock Drills	80
Pneumatic Tools	80
Saws	75
Vibrators	75

E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.

F. Smoking and Controlled Substances: Use of tobacco products, alcoholic beverages, and other controlled substances on Owner's property is not permitted.

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G. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

H. Contractor shall:

1. Not unreasonably encumber site with materials and equipment.
2. Not load structure with weight that will endanger structure.
3. Schedule use of new service elevator for construction operations. Use of passenger elevators for construction operations is prohibited.
4. Control use of existing stairwells for vertical circulation.
5. Make deliveries of construction materials, equipment, supplies and similar products and make removals at the area designated by the Owner's Representative.
6. Assume full responsibility for protection and safekeeping of stored products.
7. Move stored products that interfere with operations of Owner and other contractors.
8. Obtain and pay for land required for additional storage or work areas to supplement on-site operations.
9. Cooperate with other contractors and coordinate Work with work under separate contracts, including access to the Work.

1.12 SPECIAL SECURITY REQUIREMENTS

A. General: Comply with Owner's special security requirements at the Project Site.

B. Security Requirements:

1. Provide to the Owner the name, social security number, date of birth, place of birth, and present address for all Contractor and Subcontractor personnel at least 5 working days prior to subject personnel entering the project site. If any subject personnel have or have had security clearance it should be noted along with the level of clearance and the granting authority.
2. Background Investigation: A background investigation, the scope of which will be at the discretion of the Owner, shall be conducted on all Contractor and Subcontractor personnel. At the discretion of the Owner, subject personnel may be interviewed by the Owner regarding associates, residences, or other matters of concern to the Owner, in deciding whether to grant access to the project site. Refusal to be interviewed to resolve any questionable matters shall be deemed reasonable cause for denial of access to the project site.
3. Access to Project Site: Access to the project site will be granted only after preliminary verification of the accuracy and completeness of submitted information shows no disqualifying factors.

    a. If for any reason, a contract individual is denied access to the project site, the Owner will not disclose to the Contractor the reason for denial, nor will the Owner be liable for any expense in the replacement of the individual, or any costs incurred by the Contractor, as a result of such denial.
    b. Decisions concerning granting of access to the project site are made on a case-by-case basis. The Contractor is cautioned that individuals with criminal histories such as arrest records, felony convictions, misdemeanor convictions, or those addicted to, or abusive of, alcohol or chemicals, are likely to be denied access to the project site. The exact nature, extent, and time passed since these incidents occurred, will influence all access decisions.
    c. Illegal or undocumented aliens may be referred to other law enforcement agencies for appropriate action.

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4. Access Badges: All Contractor and Subcontractor personnel working within Owner occupied areas, renovation areas, or within the security perimeter, shall wear a current identification badge with name, photo, and social security number. The badge shall be worn on the upper part of the body so as to be clearly visible at all times. Badges shall be provided by the Contractor or Subcontractor. All Contractor and Subcontractor personnel shall also have a valid and current recognizable photo identification, such as a driver's license, on their person at all times.
5. Contractor and Subcontractor personnel authorized by the Owner to work within secure areas are subject to physical checks of all equipment, tools, and supplies, by the Owner prior to entering or exiting the secure areas. All items deemed by the Owner to pose a security risk may be required to be removed from the secure area at the end of each work day.
6. The Contractor shall maintain the security and integrity of the required site enclosure fences and gates. All gates shall be locked at the end of each working day, and the Contractor shall verify that the site is clear of personnel and secure before departing.
7. If the Contractor schedules work outside of normal hours, the Owner shall be given at least 72 hours advance notice so that access can be arranged. The Owner reserves the right to refuse entry to the site if the required notice is not provided, or if operational considerations preclude entry at the requested time.
8. When the Contractor schedules work in Owner occupied areas of the existing building or Owner occupied areas of the new building, the Owner shall be given at least 72 hours advance notice so that access can be arranged. The Owner reserves the right to refuse entry to Owner occupied areas if the required notice is not provided, or if operational considerations preclude entry at the requested time.

C. Coordination: The Owner will cooperate with the Contractor to allow work to proceed. The Contractor shall coordinate and schedule work so that the security of the project site is not compromised. Prior to the start of construction, the Owner will schedule a security coordination meeting with the Contractor to facilitate compliance with the security requirements, if requested by the Contractor.

1.13 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. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. 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.
3. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
4. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

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

D. 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.

1.14 MISCELLANEOUS PROVISIONS

A. Construction Site Security: Provide maintenance and cleaning of entire construction site on a daily basis. Secure all construction equipment, machinery and vehicles, park and store only within fenced area, and render inoperable during non-work hours. Contractor shall assure that no construction materials, tools, equipment, machinery or vehicles can be used for unauthorized entry or other damage or interference to activities and security of existing facilities adjacent to and in the vicinity of construction site.

1.15 MECHANICAL AND ELECTRICAL REQUIREMENTS OF GENERAL WORK

A. General Requirements:

1. Except as otherwise indicated, comply with applicable requirements of sections in Divisions 21, 22, and 23 for mechanical provisions for general construction work specified in Divisions 02 through 14.
2. Except as otherwise indicated, comply with applicable requirements of sections in Divisions 25, 26, 27, and 28 for electrical and electronic provisions for general construction work specified in Divisions 02 through 14.
3. Service Connections: Refer to Divisions 21, 22, 23, 25, 26, 27, and 28 for the characteristics of the mechanical, electrical, and electronic services to be connected to units of general work. Provide units manufactured or fabricated for proper connection to and utilization of available services, as indicated. Completion and final connection of mechanical services to general construction work is defined as being mechanical work and completion and final connection of electrical services to general construction work is defined as electrical work.

B. Electrical Requirements: Except as otherwise indicated, comply with applicable provisions of the National Electrical Code (NEC) and standards by National Electrical Manufacturer's Association (NEMA), for electrical components of general work. Provide Underwriters Laboratories listed and labeled products where applicable.

1.16 PERMITS AND RESPONSIBILITIES

A. Permits: The Contractor shall, without additional expense to the Owner, be responsible for obtaining any necessary licenses, fees, inspections, and permits, and for complying with any federal, and municipal laws, codes, and regulations applicable to the performance of the work. The Contractor shall also be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence and shall take proper safety and health precautions

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to protect the work, the workers, the public, and the property of others. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.

B. Permits: The Contractor shall, without additional expense to the Owner except as noted below, be responsible for obtaining any necessary licenses, fees, inspections, and permits, and for complying with any federal, and municipal laws, codes, and regulations applicable to the performance of the work. The Contractor shall also be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence and shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.

1. The Contractor shall obtain and pay for the following:

    a. Subcontractor's Trade Permits.
    b. All temporary utility costs, including but not limited to electrical, water, gas, and telephone. This specifically includes service to the Owner's and Contractor's trailer facilities.
    c. Communication service installation.
    d. Trailer permit.
    e. All other construction related costs, except as noted above.

C. The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.

D. The Contractor shall, without additional expense to the Owner, provide monetary deposits for the prosecution of the work, if required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

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SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. This Section includes but is not limited to administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Part 3 "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Main Building Cladding Material:

1. Base Product: Ribbed precast panel with mineral wool insulation.
2. Alternate MB-01: Profile metal panel

    a. Basis of Design Product: Morin MX-11.

3. Alternate MB-02: UHPC cementitious wall panel.

B. Auditorium Cladding Material:

1. Base Product: Metal plate panel with copper anodized finish.
2. Alternate AU-01: Metal plate with rustic metal finish.

    a. Finish Basis of Design Manufacturer: Old Country Millwork, Inc.

3. Alternate AU-02: UHPC cementitious wall panel.

C. Canopy Material:

1. Base Product: UHPC cementitious cast panel with custom formwork.
2. Alternate CP-01: UHPC cementitious panel with CNC 2D pattern.
3. Alternate CP-02: Metal plate.

END OF SECTION 012300

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SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes but is not limited to:

1. Administrative and procedural requirements for submitting and processing substitutions for after execution of the Agreement.

C. Related Requirements:

1. Division 01 Section "Allowances" for products selected under an allowance.
2. Division 01 Section "Alternates" for products selected under an alternate.
3. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and assemblies 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 changed product characteristics or 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.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product, fabrication, or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles which reference the specified item.

1. Substitution Request Form: Use form provided at the end of this Section. Failure to use the designated Substitution Request form, or failure to fully execute form as required, will result in rejection of proposed substitution request without review.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication, or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or 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 and performance of proposed substitution with those of the Work specified. Include annotated copy of applicable

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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/Evaluation reports evidencing compliance with building code or performance standard in effect for Project, from ICC-ES or from model code organizations building performance standard development body acceptable to authorities having jurisdiction.
j. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) working days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within ten (10) working days of receipt of request, or seven (7) working 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.

B. Source and Quantity of Substitution Requests: Only one request for substitution submitted directly from Contractor will be considered for an item; repetitive submittals of the same item will not be considered. Substitution requests from others, or that contain unrelated material, or that contain incomplete information will be returned without review. Refer to Division 01 Section “Submittal Procedures” for additional requirements.

1.4 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.

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B. Deviations and Deficiencies: No substitution shall relieve the Contactor or any subcontractor, manufacturer, fabricator, or supplier from responsibility for deficiency in the substituted product or departure or deviation from requirements of the Contract Documents.

1.5 PROCEDURES

A. Contractor's Certification and Waiver: Permission to make a substitution after Award of Contract shall be made effective only by Change Order. Acceptance by Change Order shall not relieve the Contractor, subcontractor, manufacturer, fabricator, or supplier from responsibility for deficiencies that may exist in the substituted product, nor for departure or deviation from the Contract Documents.

1. By requesting the substitution, the Contractor warrants that the proposed substitute:

    a. Has been fully investigated and determined to be equal or superior to the specified product.
    b. Will satisfy requirements of the original specified product, material, or equipment, including but not limited to appearance, quality, performance, standards, code compliance sustainability and warranty.
    c. Will have equal maintenance service and replacement part sourcing as the original
    d. Will not have an adverse effect on other trades nor affect or delay the project progress schedule.
    e. Will not affect dimensions, functional clearances or be incompatible with adjacent materials.

2. Cost data and change in contract time stated are complete. Claims for additional costs or additional time related to accepted substitution which may subsequently become apparent are waived.
3. If substitution affects a correlated function, adjacent construction, or the work of other trades or contractors, the necessary changes and modifications to the affected work shall be considered as an essential part of the proposed substitution, to be accomplished by the Contractor without additional expense to the Owner.
4. Payment will be made for changes to building design, including A/E design, detailing and construction costs caused by the substitution.
5. Coordination, installation and changes in the Work necessary for accepted substation will be complete in all respects.

B. Conditions of Acceptance: The Architect’s and Owner's approval, if granted, relies on data submitted and the opinion, knowledge, information, and belief of the Architect at the time decision is rendered.

1. The approval is conditional in nature and subject to re-evaluation and reconsideration if additional data or materials are submitted, or coordination with other work is observed to invalidate claims that substitution is equal to items originally specified.
2. The A/E's and Owner's acceptance of the substitution shall not modify the Contractor's Certification and Waiver stated in the previous paragraph.
3. Owner action and signature is required for final approval of a Substitution.

C. Fill in the attached substitution form completely. Incomplete forms cannot be properly reviewed and actioned. Failure to complete the form is grounds for rejection of the request.

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

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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 fifteen (15) working 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. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits.
c. Substitution request is fully documented and properly submitted.
d. Requested substitution will not adversely affect Contractor's construction schedule.
e. Requested substitution has received necessary approvals of authorities having jurisdiction.
f. Requested substitution is compatible with other portions of the Work.
g. Requested substitution has been coordinated with other portions of the Work.
h. Requested substitution provides specified warranty.
i. 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: Not allowed**.**

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

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PROJECT INFORMATION			
Project Name:		A/E Project No.:	
Address:			
Substitution Req #		Issue Date:	
From:			
Copies to:			

SPECIFIED PRODUCT, MATERIAL, SYSTEM OR EQUIPMENT IN THE CONTRACT DOCUMENTS:			
Specification Title:		Section	
Page#		Article/Paragraph:	
Item Specified:			
Drawing No./Detail:		Drawing Issue Date:	

PROPOSED SUBSTITUTION:			
Model No:		Product Age ☐ New ☐ 1-4 years old ☐ 5-10 years old ☐ 10+ years old	
Manufacturer:		Tel:	
Address:			
Installer:		Tel:	
Address:			

REASON FOR NOT PROVIDING SPECIFIED ITEM:	
Substitutions for Cause:	Substitutions for Convenience:
☐ Product is no longer available due to:	☐ Contractor Initiated
☐ Strike/Lockout ☐ Mfr./Supplier Bankruptcy	☐ Owner Initiated
☐ Regulatory Changes.	☐ Will reduce construction time by ____days
☐ Changed Product Compatibility or Warranty Terms	☐ Will result in cost savings of $_____.
☐ Other:	☐ Other Advantage:

Attachments Included:			
	☐ Drawings	☐ Product Data	☐ Samples
	☐ Test Reports	☐ Comparative Data	☐ Research & Evaluation Reports

LIST (2) SIMILAR INSTALLATIONS OF REQUESTED SUBSTITUTE:			
Project: 1		Date Installed:	
Address:			
Owner		Tel:	
Project: 2		Date Installed:	

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Address:			
Owner:		Tel:	
COMPARISONS OF THE SPECIFIED ITEM AND THE PROPOSED SUBSTITUTION:			
PHYSICAL CHARACTERISTICS: Compare physical characteristics of proposed product:			
Items:	Specified Product:		Proposed Product:
Supplier/Distributor:			
Mfr./Rep:			
Size:			
Weight:			
Appearance:			
PERFORMANCE: Insert testing feature/attributes, test protocol and performance below:			
Features/Attributes	Test Protocol	Specified Performance:	Proposed Performance
WARRANTY: Proposed product offers the same warranty? ☐ Yes ☐ No; explain			
Items:		Specified Product:	Proposed Product:
MAINTENANCE SERVICE: Same day service		available? ☐ Yes ☐ No; explain:	
SPARE PARTS: Source/Location:			
Items:		Specified Product:	Proposed Product:
CODE REQUIREMENTS			
Reference Testing Items:		Specified Product:	Proposed Product:
ADA COMPLIANCE:	☐ Yes ☐ No; explain:		
SUSTAINABLE DESIGN			
Features/Attributes:		Specified Product:	Proposed Product:

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CHANGE: Describe changes required in other elements of the Work to accommodate the proposed substitution, including work performed by the Owner and separate contractors:
IMPACT: Describe the impact the proposed substitution will have on the work schedule in comparison to the work schedule without approval of the proposed substitution:
Proposed Change in Contract Time: ☐ Yes ☐ No [Add] [Deduct] _____Days.
COST: Define detailed cost impact of the proposed substitution in relation to the originally specified item, including related modifications required to other Work:
Savings to the Owner for accepting substitution $_____

Contractor's Certification/Waiver: Substitutions after Award of Contract shall be made effective only by Change Order and shall not relieve the proposer from responsibility for deficiencies that may exist in the substituted product, departure, or deviation from the Contract Documents. The Undersigned certify:

1. Except as otherwise expressly defined by this Request for Substitution and approved by Change Order, signer warrants that the proposed substitution:
    a. Has been fully investigated and determined to be equal or superior to specified product.
    b. Will satisfy requirements of the original specified product, material or equipment, including but not limited to appearance, quality, performance, code compliance, sustainability, and warranty.
    c. Will have equal maintenance service and replacement part sourcing as the original
    d. Will not have an adverse effect on other trades nor affect or delay progress schedule.
    e. Will not affect dimensions, functional clearances or be incompatible with adjacent materials.
    f. Will not affect compliance with a building code or performance standard in effect for project.
2. Cost data and change in contract time stated are complete. Claims for additional costs or additional time related to accepted substitution which may subsequently become apparent are waived.
3. If substitution affects a correlated function, adjacent construction, or the work of other trades or contractors, the necessary changes and modifications to the affected work shall be considered as an essential part of the proposed substitution, to be accomplished by the Contractor without additional expense to the Owner.

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4. Payment will be made for changes to building design, including A/E design, detailing and construction costs caused by the substitution.
5. Coordination, installation, and changes in the Work necessary for accepted substation will be complete in all respects.

Contractor's Signature:		Date:	

ARCHITECT/ENGINEER'S REVIEW AND RESPONSE:			
Conditions of Acceptance: Approval relies on data submitted, and the opinion, knowledge, information, and belief of the Architect/Engineer at the time decision is rendered. Approval is conditional in nature, and subject to re-evaluation and reconsideration, if additional data or materials submitted, or coordination with other work is observed to invalidate claims that substitution is equal to items originally specified.			
☐ Substitution Approved -- Make submittals and prepare Change Order			
☐ Substitution Approved as Noted -- Make submittals and prepare Change Order			
☐ Substitution Rejected -- Use specified materials.			
☐ Substitution Received too late -- Use specified materials.			
☐ More Information Required			
Signed By:		Date:	

OWNER'S REVIEW AND RECOMMENDATIONS:			
☐ Substitution Approved -- Make submittals and prepare Change Order			
☐ Substitution Approved as Noted -- Make submittals and prepare Change Order			
☐ Substitution Rejected -- Use specified materials.			
Signed By:		Date:	

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SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Administrative and procedural requirements for handling and processing Contract modifications.

C. Related Requirements:

1. Division 01 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
2. Division 01 Section "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.2 MINOR CHANGES IN THE WORK

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

1.3 PROPOSAL REQUESTS

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

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.

    a. Work Change Proposal Requests will be issued on electronic facsimile of Architect/Engineer’s Bulletin Form.

2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

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e. Quotation Form: Use forms acceptable to the Owner.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect and Owner.

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. Include an updated energy model report or summary that indicates the effect of the change on energy performance, compliance with applicable building codes or Performance Standards at the time of delivery or in the future.
7. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
8. Proposal Request Form: Use form acceptable to the Owner.

1.4 ADMINISTRATIVE CHANGE ORDERS

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

1.5 CHANGE ORDER PROCEDURES

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

1.6 CONSTRUCTION CHANGE DIRECTIVES

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. 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, or provide lump sum acceptable to the Owner.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract, or provide lump sum acceptable to the Owner.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

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SECTION 012900 – PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Administrative and procedural requirements necessary to prepare and process Applications for Payment.

C. Related Requirements:

1. Division 01 Section "Unit Prices" for administrative requirements governing the use of unit prices.
2. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
3. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.2 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.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.

a. Application for Payment forms with continuation sheets.
b. Submittals Schedule
c. Items required to be indicated as separate activities in Contractor's updated Construction Schedule.

2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
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.

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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. Owner's name.
    c. Owner's Project number.
    d. Name of Architect.
    e. Architect's Project number.
    f. Contractor's name and address.
    g. Date of submittal.

2. Arrange the schedule of values in tabular form, consistent with approved form, with separate columns to indicate the following for each item listed:

    a. Related Specification Section or division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.

        1) Labor.
        2) Materials.
        3) Equipment.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
4. 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.

5. 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.
6. 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.
7. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
8. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
9. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

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10. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.4 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 paid for by Owner.

B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

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

1. Other Application for Payment forms proposed by the Contractor may be acceptable to Owner. Submit forms for approval with initial submittal of schedule of values.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.

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1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

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. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. 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. Sustainable Design plans, including preliminary project materials cost data.
7. Schedule of unit prices.
8. Submittal schedule (preliminary if not final).
9. List of Contractor's staff assignments.
10. List of Contractor's principal consultants.
11. Copies of building permits.
12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
13. Initial progress report.
14. Report of preconstruction conference.
15. Certificates of insurance and insurance policies.
16. Performance and payment bonds.
17. Data needed to acquire Owner's insurance.

I. 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.

    a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."

2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
3. Administrative actions and submittals that shall proceed or coincide with this application include:

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a. Temporary or final occupancy permits or similar approvals.
b. Warranties (guarantees) and maintenance agreements.
c. Test/adjust/balance records.
d. Maintenance instructions.
e. Meter readings.
f. Start-up performance reports.
g. Change-over information related to Owner's occupancy, use, operation and maintenance.
h. Final cleaning.
i. Application for reduction of retainage, and consent of surety.
j. Advice on shifting insurance coverages.
k. Final progress photographs.
l. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.

J. 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. Certification of completion of final punch list items.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Updated final statement, accounting for final changes to the Contract Sum.
5. AIA Document G706.
6. AIA Document G706A.
7. AIA Document G707.
8. Evidence that claims have been settled.
9. 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.
10. Final liquidated damages settlement statement.
11. Proof that taxes, fees, and similar obligations are paid.
12. Waivers and releases.

1.5 PAYMENT REVIEW MEETING

A. Application for Payment Review Meeting: Construction Manager will conduct payment application review meeting for each application for payment. Coordinate payment application review meetings with progress meetings.

1. Attendees: In addition to representatives of the Owner, the Architect/Engineer, the Contractor and possibly Lender's representative.

a. The group shall conduct a walk through the project with draft application, noting status of each line item in regard to percentage completion.

2. Meeting Agenda: Conduct meeting to discuss and recommend approval, or modification of the draft application relative to walk through comments.

a. Revise and resubmit application for payment based on recommendations of the Review Meeting participants.

3. Recommendations for withholding payment (in whole or in part) include:

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a. Percent complete reported is incorrect.
b. Liens filed by subcontractors and suppliers
c. Non-conforming work
d. Calculations with mathematical errors.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. This Section includes but is not limited to:

1. Administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

    a. General coordination procedures.
    b. Coordination drawings.
    c. Requests for Information (RFIs).
    d. Digital project management procedures.
    e. Web-based Project management software package.
    f. Project meetings.

C. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

D. Related Requirements:

1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section “Construction Waste Management and Disposal” for additional waste salvage requirements.
4. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.
5. Division 01 Section “Sustainability Design Requirements” for indoor environmental air quality.
6. Division 01 Section "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.2 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: "Request for Information". Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Include the following information in tabular form:

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1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Print Coordination Drawing: Submit two opaque copies of each submittal. Architect will return one copy.

1. Submit five copies where Coordination Drawings are required for Operation and Maintenance Manuals. Architect will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.

C. Digital Coordination Drawings: Submit electronic digital files for incorporation into 3-D model for full coordination.

D. Key Personnel Names: Within fifteen (15) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, on web-based software directory, and in prominent location in built facility. Keep list current at all times.

1.4 GENERAL COORDINATION PROCEDURES

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

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
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. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activitiesto 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.

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C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 COORDINATION DRAWINGS

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

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to the coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Provide coordinated composite drawings, drawn at a scale not less than 1/4 inch per foot in both plan and elevation, including, but not limited to, equipment, ducts, pipe sleeves, piping including plumbing and sprinkler systems, lighting, special supports and other items contained within the space and finished ceiling. Show mechanical and electrical services and architectural and structural features drawn to scale.
d. Provide composite drawings for corridors, specialty spaces, mechanical rooms, shafts, tunnels, and other areas of limited space with complex systems. Distribute copies of composite drawings to all trades to assure a complete, coordinated installation of work within the space available.
e. Include elevation drawings indicating finish ceiling heights, and heights above finished floor to bottom of ductwork, piping, conduit and other overhead fixtures and equipment.

1) Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
2) Draw required details at a scale not less than 3/4 inch per foot.

f. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
g. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
h. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
i. Indicate required installation sequences.

1) Scheduling, sequencing movement, and positioning of large equipment into the building during construction.

j. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed

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resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Submit certificate guaranteeing that coordination drawings have been done and are being utilized at the project site.
3. Call attention in advance to Design Professional of any dimensional or detail information needed to complete the coordination drawings.

    a. Refer to Sections of Division 23 and Division 26 for specific Coordination Drawing requirements for mechanical and electrical installations.
    b. Indicate relationship of components shown on separate Shop Drawings.

Retain following subparagraph if Owner/Architect agreement does NOT contain statement for Electronic data Agreement

    c. Electronic Data: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals upon execution of the “Electronic Data Transfer Agreement” included at the end of Division 01 Section “Project Record Documents.”

4. Coordination drawings are considered shop drawings and shall be definitive in nature, with project specific information drawn accurately to a scale large enough to indicate and resolve conflicts. Submit coordination drawings for information. Architect will not take any action but may define coordination conflicts or problems and inform the Contractor of such conflicts or problems.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work. Designate fire-rated walls, partitions and floors.
2. Plenum Space: Indicate subframing for support of ceiling, raised access floor and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical and Electrical Rooms: Provide coordination drawings for mechanical and electrical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural and Through Penetrations: Indicate fire-rated and non-fire-rated penetrations and openings required for all disciplines through interior and exterior walls, interior partitions, foundation walls, and floor slabs.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, curtain wall anchorage, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping and equipment pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, supply piping, sanitary, floor and roof drain piping, heat tracing, and conduit runs, including insulation, bracing, flanges, and support systems. Indicate maintenance access points and required maintenance areas.
    b. Dimensions of major components, such as control boxes, dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.
    d. Sleeves and capped utilities for future work.

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7. Electrical Work: Show the following:

    a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
    b. Light fixture, exit light, electrified door hardware, access controls, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection Systems: Show the following:

    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, Architect will review Coordination Submittals for assessment of completion and aesthetic considerations such as finishes and layouts; not for accuracy or content, but not for the details of the coordination, which are Contractor's responsibility. If it is determined that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Contractor will be informed and requested to make changes as directed and resubmit for review.

C. Coordination Drawing Process: Prepare coordination drawings in the following manner:

1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.
6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
7. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.

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

1. File Preparation Format:

    a. Same digital data software program, version, and operating system as original Drawings.

2. File Submittal Format: Submit or post coordination drawing files using PDF format.
3. BIM File Incorporation: Develop and incorporate coordination drawing files into BIM established for Project.

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a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.

4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

   a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
   b. Digital Data Software Program: Drawings are available in REVIT.
   c. Contractor shall execute an Electronic Data Transfer Agreement included at the end of Division 01 Section "Project Record Documents".

1.6 REQUESTS FOR INFORMATION (RFI'S)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, the Contractor shall prepare and submit an electronic RFI in the form specified, and coordinate and submit RFIs in a prompt manner to avoid delays in the Contractor's work or work of subcontractors.

1. RFIs shall originate with Contractor, reviewed by the Architect and returned to the Contractor with a copy to the Construction Manager. The Architect will return RFI's submitted to the Architect by other entities controlled by Contractor with no response.
2. Rejection: The following Contractor-generated RFIs will be deemed frivolous and returned without action:

   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for approval of Contractor's means and methods.
   d. Requests for resolution of construction deficiencies or failed inspections.
   e. Requests for coordination information already indicated in the Contract Documents.
   f. Requests for adjustments in the Contract Time or the Contract Sum.
   g. Requests for interpretation of Architect's actions on submittals.
   h. Incomplete RFIs or inaccurately prepared RFI's.
   i. Solicit clarification of comments that have been communicated to the Contractor by the Architect in the course of shop drawing review or the review of other required submittals.

3. The Owner reserves the right to assess the Contractor for the cost (based on time and materials) of the review process performed by the Architect and/or any of the Architect's or Owner consultants when RFIs fail to conform to the requirements stated herein, or in the opinion of the Architect, are unnecessary or frivolous (i.e.; the subject of the inquiry noted in the RFI is suitably and/or clearly addressed in the Contract Documents or meet requirements for rejection).

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Owner name.
3. Project number.
4. Name of Architect.
5. Date.
6. Name of Contractor.
7. RFI number, numbered sequentially.

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8. RFI subject.
9. Specification Section number and title and related paragraphs, as appropriate.
10. Drawing number and detail references, as appropriate.
11. Field dimensions and conditions, as appropriate.
12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
13. Contractor's signature.
14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

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

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow an average of ten(10) working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. Architect 's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
2. Architect's action may include revisions to the Contract Documents; however, revisions to the Contract Documents will not be provided for minor clarifications or revisions which can be described in a written narrative response, or are part of the Contractor's coordination responsibilities for construction operations.
3. Architect will provide responses for up to 5 RFIs per day. If more than 5 RFIs are submitted per day (more than 25 RFIs per week), the Contractor shall prioritize RFIs responses needed based on most to least critical. Due dates based on 5 working day duration will be adjusted accordingly.
4. 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 Request according to Division 01 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within five (5) working days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of web-based Project management software and includes not less than the following data:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFI’s that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive and Proposal Request, as appropriate.

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9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within five (5) working days if Contractor disagrees with response.

1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's BIM model will be provided by Architect for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Digital Drawing Software Program: Contract Drawings are available in REVIT.
4. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual.

    a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement included in this Project Manual.

5. The following digital data files will be furnished for each appropriate discipline:

    a. Floor plans.
    b. Reflected ceiling plans.

B. Web-Based Project Management Software Package: Provide, administer, and use a web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.

1. Web-based Project management software includes, at a minimum, the following features:

    a. Compilation of Project Directory data, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
    b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
    c. Document workflow planning, including task and issue management, allowing customization of workflow between project entities.
    d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
    e. Online collaboration including tracking status of each Project communication and correspondence in real time, and log time and date when responses are provided.
    f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
    g. Processing and tracking of payment applications.
    h. Processing and tracking of contract modifications.
    i. Creating and distributing meeting minutes.
    j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
    k. Management of construction progress photographs.

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l. Mobile device compatibility, including smartphones and tablets.
m. Archiving functions.

2. Provide up to sixteen (16) Project management software user licenses for use of Owner, Architect, and Architect's consultants. Provide up to eight (8) hours of software training at Architect's office for web-based Project software users.
3. At completion of Project, provide digital archive files to the Owner and to the Architect in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.

C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.8 PROJECT MEETINGS

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

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

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

1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; Inspection staff, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Responsibilities and personnel assignments.
b. Tentative construction schedule.
c. Phasing.
d. Critical work sequencing and long-lead items.
e. Designation of key personnel and their duties.
f. Lines of communications.
g. Use of web-based Project software.
h. Procedures for processing field decisions and Change Orders.
i. Procedures for RFIs.
j. Procedures for testing and inspecting, including any special inspections.
k. Procedures for processing Applications for Payment.
l. Distribution of the Contract Documents.
m. Submittal procedures.

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n. Sustainable design requirements.
o. Preparation of Record Documents.
p. Use of the premises.
q. Work restrictions.
r. Working hours.
s. Owner's occupancy requirements.
t. Responsibility for temporary facilities and controls.
u. Procedures for moisture and mold control.
v. Procedures for disruptions and shutdowns.
w. Construction waste management and recycling.
x. Parking availability.
y. Office, work, and storage areas.
z. Equipment deliveries and priorities.
aa. First aid.
bb. Security.
cc. Progress cleaning.
dd. Indoor air quality procedures.
ee. Review environmental goals and sustainable design procedures for the Project.
ff. Review required submittals and LEED™ certification requirements as described in Division 1 Section “Sustainable Design Requirements.”

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Sustainability Design Requirements Coordination Conference: Owner will schedule and conduct a sustainable design coordination conference before starting construction, at a time convenient to Owner, Architect, and Contractor.

1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent and sustainable design coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect meeting requirements for sustainable design requirements, including the following:

a. Sustainable Design Project Checklist.
b. General requirements for sustainable design related procurement and documentation.
c. Project closeout requirements and sustainable design certification procedures.
d. Construction waste management.
e. Construction operations and sustainable design requirements and restrictions.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

D. Preconstruction Indoor Air Quality (IAQ) Conference: Schedule a preconstruction IAQ conference separately from other preconstruction conferences, at a time convenient to Owner, Construction Manager, if one is retained by Owner, and Architect, but no later than 15 working days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned

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

2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Indoor air quality procedures: Discuss the IAQ and environmental impact compliance procedures specified in Division 01 Section "IAQ Requirements."

        1) The purpose of this agenda item is to develop a mutual understanding of the IAQ and environmental impact program requirements, and coordination of the Contractor's management of the program with the Architect and Owner the Construction Quality Manager.

    b. Product Emission Testing Coordination.

E. Preconstruction Waste Management Conference: Schedule a preconstruction waste management conference separately from other preconstruction conferences, at a time convenient to Owner, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of the Owner, 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. Review waste management goals for the Project and Contractor's waste management plan, as specified in Division 1 Section "Construction Waste Management."

F. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFI's.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Sustainable design requirements.
    i. Review of mockups.
    j. Possible conflicts.
    k. Compatibility requirements.
    l. Time schedules.
    m. Weather limitations.
    n. Manufacturer's written instructions.
    o. Warranty requirements.
    p. Compatibility of materials.
    q. Acceptability of substrates.
    r. Temporary facilities and controls.
    s. Space and access limitations.
    t. Regulations of authorities having jurisdiction.

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u. Testing and inspecting requirements.
v. Installation procedures.
w. Coordination with other work.
x. Required performance results.
y. Protection of adjacent work.
z. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

G. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 60 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of Record Documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Procedures for completing and archiving web-based Project software site data files.
d. Submittal of written warranties.
e. Requirements for completing sustainable design documentation.
f. Requirements for preparing operations and maintenance data.
g. Requirements for delivery of material samples, attic stock, and spare parts.
h. Requirements for demonstration and training.
i. Preparation of Contractor's punch list.
j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
k. Submittal procedures.
l. Coordination of separate contracts.
m. Owner's partial occupancy requirements.
n. Installation of Owner's furniture, fixtures, and equipment.
o. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

H. Progress Meetings: Conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in

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planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Resolution of BIM component conflicts.
        4) Status of submittals.
        5) Status of sustainable design documentation.
        6) Deliveries.
        7) Off-site fabrication.
        8) Access.
        9) Site utilization.
        10) Temporary facilities and controls.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Status of correction of deficient items.
        14) Field observations.
        15) Status of RFI’s.
        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.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

I. Coordination Meetings: Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

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2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    c. Review present and future needs of each contractor present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Resolution of BIM component conflicts.
        4) Status of submittals.
        5) Construction waste management and recycling.
        6) Sequence of finish installation and indoor air quality procedures.
        7) Deliveries.
        8) Off-site fabrication.
        9) Access.
        10) Site utilization.
        11) Temporary facilities and controls.
        12) Work hours.
        13) Hazards and risks.
        14) Progress cleaning.
        15) Quality and work standards.
        16) Status of correction of deficient items.
        17) Field observations.
        18) Status of Requests for Information (RFIs).
        19) Status of Proposal Requests (PRs).
        20) Pending changes.
        21) Status of Change Orders.
        22) Pending claims and disputes.
        23) Documentation of information for payment requests.
        24) Indoor air quality procedures
        25) Sustainable Design certification requirements

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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SECTION 013200 – CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

    a. Startup construction schedule.
    b. Contractor's Construction Schedule.
    c. Construction schedule updating reports.
    d. Daily construction reports.
    e. Material location reports.
    f. Site condition reports.
    g. Unusual event reports.

C. Related Requirements:

1. Division 01 Section "Submittal Procedures" for submitting schedules, reports, and electronic submittal requirements.
2. Division 01 Section "Quality Requirements" for schedule of tests and inspections.
3. Division 01 Section "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.

1.2 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 completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

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 the critical path of Project and when activities can be performed.

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.

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

1. Float time belongs to Owner.
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.

1.3 INFORMATIONAL SUBMITTALS

A. Preparation: Submit a schedule of submittals, in compliance with requirements specified in Division 01 Section "Submittal Procedures".

1. Arrange submittal schedule in chronological order by dates required by construction schedule. Include time required for review, re-submittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
2. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

B. Initial Submittal: Submit concurrently with preliminary CPM schedule. Include submittals required during the first 60 days of construction.

1. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
2. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

C. Final Submittal Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

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

1. PDF electronic file.

E. Startup construction schedule.

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

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

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

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
2. Construction progress schedule shall cover all divisions of the work.
3. Contractor's construction schedule is subject to the Owner's review and approval.

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H. 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 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 each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
3. Total Float Report: List of activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

I. Construction Schedule Updating Reports: Submit with Monthly Report.

J. Daily Construction Reports: Submit at weekly intervals.

K. Material Location Reports: Submit at weekly intervals.

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

M. Unusual Event Reports: Submit at time of unusual event.

N. Qualification Data: For scheduling consultant.

1.4 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 work stages, area separations, interim milestones, and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

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1.5 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.
3. Schedules shall include break down in detail necessary to permit proper and complete coordination of all trades in each division of the work.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. General: Immediately following contract award, prepare a construction progress schedule covering all divisions of the work.

1. Following approval by the Owner, distribute copies of the final schedule to interested parties.
2. Provide schedule break down in detail necessary to permit proper and complete coordination of all trades in each division of the work.
3. Incorporate tentative dates for interruption of utilities services.

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

1. Use software package for current Windows operating system.

C. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting, using CPM scheduling.

1. In-House Option: Owner may waive requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

D. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion. Complete development of the network diagram in sufficient time to submit the CPM schedule no later than 60 working days after commencement of the Work.

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.

E. Activities: Treat each floor 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.
2. Temporary Facilities: Indicate start and completion dates for the following as applicable:

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a. Securing of approvals and permits required for performance of the Work.
b. Temporary facilities.
c. Construction of mock-ups, prototypes and samples.
d. Owner interfaces and furnishing of items.
e. Interfaces with Separate Contracts.
f. Regulatory agency approvals.
g. Punch list.

3. Procurement Activities: Include procurement process activities for the following long lead-time 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.
4. 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.
5. Startup and Testing Time: Include no fewer than 30 days for startup and testing.
6. Commissioning Time: Include no fewer than 30 days for commissioning.
7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
8. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.

F. 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. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. 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.

7. 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.

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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.
n. Commissioning.

8. 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.

G. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, Final Completion, and the following:

1. Temporary enclosure an space conditioning.

H. 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.

I. 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 the Contract Time.

J. 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.
3. As the Work progresses, indicate Final Completion percentage for each activity.

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

L. 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.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within 14 days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CPM SCHEDULE REQUIREMENTS

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

B. Startup Network Diagram: Submit diagram within 14 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 the Notice to Proceed.

    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.

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 to coordinate with the Contract Time.

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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 inspection.
    j. Commissioning.
    k. Punch list and Final Completion.
    l. 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, sustainable design 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.

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3. Main events of activity.
4. Immediately 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.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

    a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.4 REPORTS

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

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.

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13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Construction Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one working day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

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SECTION 013233 – PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Administrative and procedural requirements for the following:

    a. Preconstruction photographs.
    b. Concealed Work photographs.
    c. Periodic construction photographs.
    d. Final Completion construction photographs.
    e. Construction webcam.

C. Related Requirements:

1. Division 01 Section "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
2. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
3. Division 02 Section "Selective Demolition" for photographic documentation before selective demolition operations commence.

1.2 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key floor plans of building with notation of vantage points marked for location and direction of each photograph. Indicate story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three days of taking photographs.

1. Submit photos by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description in file metadata tag or in web-based Project management software site:

    a. Name of Project.
    b. Name and contact information for photographer.
    c. Name of Architect.
    d. Name of Contractor.
    e. Date photograph was taken.
    f. Description of location, vantage point, and direction.
    g. Unique sequential identifier keyed to accompanying key plan.

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1.3 QUALITY ASSURANCE

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

1.4 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.

B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

C. Metadata: Record accurate date and time from camera.

D. File Names: Name media files with date, Project area, and sequential numbering suffix.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

3.1 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.

B. General: Take photographs with maximum depth of field and in focus.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag construction limits before taking construction photographs.
2. Take 50 photographs to show existing conditions adjacent to property before starting the Work.
3. Take 50 photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:

1. Underground utilities.
2. Underslab services.
3. Piping.
4. Electrical conduit.

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5. Waterproofing and weather-resistant barriers.

E. Periodic Construction Photographs: Take 50 photographs weekly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

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

G. Final Completion Construction Photographs: Take 200 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

H. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.
3. Circumstances that could require additional photographs include, but are not limited to, the following:

    a. Special events planned at Project site.
    b. Immediate follow-up when on-site events result in construction damage or losses.
    c. Photographs shall be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
    d. Substantial Completion of a major phase or component of the Work.
    e. Extra record photographs at time of final acceptance.
    f. Owner's request for special publicity photographs.

END OF SECTION 013233

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SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Requirements for the submittal schedule, and administrative and procedural requirements for submitting the following types of submittals:

a. Action Submittals:

1) Product Data.
2) Sustainable Design Requirements.
3) Shop Drawings.
4) Samples.

b. Informational Submittals:

1) Contractor's Submittal Schedule.
2) Coordination Drawings.
3) Product Schedule.
4) Qualification Data
5) Certificates and Certifications.
6) Test, Research and Inspection Reports.
7) Sustainable Data.
8) Fabrication Engineering and Design Data.
9) Manufacturer’s Field Reports.

c. Closeout Submittals:

1) As-Built Drawings for incorporation in Project Record Documents.
2) Maintenance Data.
3) Field Test Reports.
4) Final Construction Photographs.

2. Submittal procedures include those for submitting electronic copies of submittals (except samples), in portable document file (.pdf) format.

C. Related Requirements:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Division 01 Section "Substitutions" for submitting substitution requests.
3. Division 01 Section "Project Management and Coordination for submitting Coordination Drawings, RFIs and Meeting/Conference minutes, subcontract list and requirements for web-based Project software.
4. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports including Contractor's construction schedule.

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5. Division 01 Section “Photographic Documentation” for submitting preconstruction photographs, periodic construction photographs and Final Completion construction photographs.
6. Division 01 Section "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
7. Division 01 Section “Product Requirements” for administrative and procedural requirements for selection of products for use in Project, and for submitting comparable product requests.
8. Division 01 Section "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
9. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
10. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
11. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 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 that do not require Architect's actionable review. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. 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.

E. Fabrication Engineering and Design: Known in various jurisdictions and professional licensing laws as "Delegated Design", refers to engagement of a professional engineer licensed to practice in the jurisdiction of the project, who is responsible for engineering and design of fabrications required to comply with design criteria and engineering performance requirements specified in technical sections of the specifications.

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit a master schedule list of submittals, arranged in chronological order by dates required by the contractor's construction schedule. Include the 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.

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2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first sixty (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. Look-Ahead Schedules: Maintain and update submittal schedules to reflect current conditions at the project site and project status. Submit revised submittal schedules highlighting the submittals planned in the subsequent six weeks.
4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled date of fabrication.
    i. Scheduled dates for installation.
    j. Activity or event number.

5. Submittal Schedule Review: Architect shall review the Submittal Schedule for compliance with the Contract Documents and assure staffing necessary to review and process submittals during construction. Make necessary adjustments requested by the Architect. Schedule shall be submitted as one of the conditions precedent to the Architect releasing CAD files for Contractor’s use.
6. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.

1.4 PRE-CONSTRUCTION PHOTOGRAPHS

A. Pre-Construction Photographs: Conduct a pre-construction Survey and submit pre-construction photographs to document existing conditions of the property and surrounding properties, which could be misconstrued as damage resulting from demolition and other construction operations; including but not limited to physical plant, structural surfaces, equipment, finishes and facades. File copies with Owner's Representative prior to commencing Work.

1.5 SUBMITTALS FOR FABRICATION ENGINEERING AND DESIGN ITEMS

A. Fabrication Engineering Data: Submit engineering of fabrication is required by technical sections of the Specifications, comprehensive engineering calculations demonstrating conformance to the requirements of the Contract Documents and comply with requirements of authorities having jurisdiction.

1. Calculations shall be legible and incorporate sufficient cross-references to shop drawings to make calculations readily understandable and reviewable.
2. Test reports are not an acceptable substitute for calculations.
3. Shop drawings that demonstrate compliance with the Contract Documents, Design Intent, and method of execution of the Work.
4. At a minimum, engineering calculations shall contain:

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a. Analysis of design elements or component members.
b. Section property computations for structural framing members.
c. Analysis of anchors, including anchors embedded in concrete.
d. Signature and seal of the qualified licensed professional engineer responsible for their preparation.

1.6 QUALITY ASSURANCE

A. Engineering Professional: A Professional Engineer licensed to practice in the state of the project, shall be engaged by the Contractor to provide engineering of materials, components or assemblies defined in technical sections of the Specifications to require engineering, who is experienced in providing the engineering services required.

1. Except as otherwise identified in Technical Sections of the Specifications, the Professional Engineer shall have at least 5 consecutive years' experience providing fabrication engineering and design services on projects of comparable size and scope, including material, design complexity to this project, that has resulted in applications with a record of successful in-service performance.

1.7 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 upon execution of the “Electronic Data Transfer Agreement” included at the end of Division 01 Section “Project Record Documents.”

1. Architect's digital data drawings convey design intent and are not considered construction drawings. Contractors are given the digital data drawings to help facilitate their work. The Architect make no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings. Contractors are required to prepare and submit construction shop drawings that detail the construction of their work, coordinating with adjacent materials, assemblies, and components for the purpose of building the project. Submission of the A/E's digital data drawing files in lieu of shop drawings is strictly forbidden.

a. Digital Drawing Software Program: The Contract Drawings are available in REVIT and “.dwg” format.
b. The following plot files will by furnished for each appropriate discipline:

1) Floor plans.
2) Reflected ceiling plans.

B. Process: The Architect will use the Contractor’s web-based Construction Contract Administration (CCA) software system for tracking and responding to communications from the Contractor and for submitting requests and information to the Contractor.

1. Contractor shall prepare requests and submittals on electronic forms acceptable to Architect and Owner provided the data included is consistent with the requirements included in this Section.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

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1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Combine and submit items required for each Specification Section and transmit concurrently. Partial submittals for portions of the Work will not be reviewed unless indicated on the approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages.
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.

5. Incomplete Submittals and Excessive Errors: Shop drawings, product data, samples, and administrative submittals that contain excessive errors or that are incomplete will be returned unchecked and any delay caused thereby will be the responsibility of the Contractor.
6. Arrange for preparation of required submittals in sufficient detail to permit analysis and review by Architect, sufficiently early to allow for review, and accommodate the rate of construction progress required under the Contract. Delete or mark out extraneous material not relevant to the Project.
7. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
8. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
9. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
10. 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. Package submittals to cover complete assemblies or systems.

D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on the first full working day following Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow ten (10) working 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. Resubmittal Review: Allow an average of ten (10) working days for review of each resubmittal.
4. Concurrent Consultant Review: Where Contract Documents indicate that submittals may be transmitted simultaneously to the Architect and the Architect's consultants, allow ten (10) working days for review of each submittal. . Notification will be simultaneously routed to all of the consultants who are responsible for review and actioning stating that the Submittal has been posted as a Bluebeam Studio session and is open and available for review. Each consultant will make their comments in the session to allow for simultaneous and concurrent review by the design team. Submittal will be returned to Architect before being returned to Contractor. Specification Sections having submittals requiring concurrent review include but are not limited to the following:

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a. To be determined jointly by Owner, Contractor, and Architect.

5. Extended Review: Allow 20 working days for initial review of the following submittals:

   a. Coordination drawings specified in Division 01 Section "Project Management and Coordination".
   b. Technical Sections with requirements for "Fabrication Engineering and Design".
   c. Division 03 Sections "Architectural Precast Concrete" and "Structural Precast Concrete".
   d. Division 05 Sections for "Structural Steel", "Cold Formed Metal Framing, Miscellaneous Metal Fabrications" and "Decorative Formed Metal"
   e. Division 06 "Architectural Woodwork" for casework drawings.
   f. Division 08 Sections for "Access Doors", "Overhead Coiling Doors", "Door Hardware", "Automatic Door Operators", "Glass and Glazing", ".
   g. Division 11 Sections for electrically operated items of equipment.
   h. Division 12 Sections for electrically operated furnishings, blinds, multiple seating with communication and power
   i. Division 21 Sections for Fire Protection Systems, Plumbing Fixtures and Trim, Air Distributions Devices, Sheet Metal Work, and A/C Controls.
   j. Division 23 Sections for HVAC temperature controls, and HVAC balancing report.
   k. Division 26 Sections for Lightning Protection and Other Special Construction.
   l. Division 26 Sections for Wiring Devices, Lighting Fixtures.
   m. Division 27 Sections for Communications, including Data, Telephone, and other Intercommunication Systems.
   n. Division 28 Sections for Electronic security systems, including access control, intrusion detection, video surveillance, fire detection and alarm, and similar safety and security systems.

6. Direct Transmittal to Consultant: Where the Contract Documents indicate that submittals may be transmitted directly to Architect's consultants, provide duplicate copy of transmittal and submittal to Architect. Submittal will be returned to Architect before being returned to Contractor.
7. Shop Drawings: The Contractor shall prioritize submission and processing shop drawings in accordance with the Project Construction Schedule. No more than five Shop drawings of a single trade may be received and processes in one week, with a maximum 50 pages. The Architect will advise the Contractor of additional time required.
8. No extension of the Contract Time will be authorized because of:

   a. Failure to comply with approved Submittal Schedule.
   b. Failure to transmit submittals enough in advance of the Work to permit processing.

9. Architect will review each submittal a maximum of two (2) times--the initial submittal plus 1 resubmittals. Contractor shall process submittals in complete packages to allow Submittal reviews to be completed within the requisite review period.

   a. For submittals in excess of review periods stated above, the Contractor shall reimburse the Owner, for additional services required of the Architect and the Architect's consultant by these additional resubmittals.
   b. No additional time will be allowed the Contractor for delays caused by an excess number of submittals.

E. Electronic Submittals: Two-dimensional documents, such as schedules, shop drawings, product data, and general information, shall be submitted electronically in portable document format (PDF) file. Identify and incorporate information in each electronic submittal file as follows:

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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. File Naming: Each Submission shall have a file name consisting of project name, section number, item number, and revision number. The A/E Project Shop Drawing review stamp will read and incorporate this file name. It is therefore imperative that each submittal file use the following naming convention:

    a. Each Submittal shall be created with a four-part alpha numeric file naming system, with each part separated by a dash. Each item is **bolded** and underlined to draw attention to it in the examples below:

        1) The first part is the project abbreviation (e.g., **IDENT**-061000-0001-01).
        2) The second part is the specification section number (e.g., IDENT-**061000**-0001-01.
        3) The third part is the item number of each Submittal required in that specific specification section. Each item shall have an individual number. Do not group multiple items in a single item number, as they will be returned not logged in and without an action reserved for proper submissions. The first item shall be 0001, the next item 0002, etc. (e.g., IDENT-061000-**001**-01).
        4) The fourth part represents the number of times the item has been submitted for review. The first submission shall be 01, the second submission shall be 02, etc. (e.g., IDENT-061000-0001-**00**).
        5) Place a single dash between each part of the File Name.

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 electronic facsimile of form acceptable to the Architect, containing the following:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Contractor.
    e. Name of Entity or firm that prepared the submittal.
    f. Names of subcontractor, manufacturer, and supplier.
    g. Category and type of submittal.
    h. Submittal purpose and description.
    i. Specification Section number and title.
    j. Specification paragraph number or drawing designation and generic name or material equipment finish code, for each of multiple items.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Related physical samples submitted directly.
    n. Indication of full or partial submittal.
    o. Transmittal number, numbered consecutively.
    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.

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c. Manufacturer name.
d. Product name.

6. Include Contractor's certification/approval stamp stating that information submitted complies with requirements of the Contract Documents.

F. Options: Identify options requiring selection by Architect.

G. 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.

1. Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals. Provide accompanying detailed written explanation for each deviation.
2. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
4. Transmittal shall contain the same information as the first transmittal except that numbers shall run consecutively following naming and numbering protocol.
5. No new material shall be included on the same transmittal for a resubmission.
6. On resubmissions of shop drawings, the Architect's review shall be generally restricted to review of revisions to the original shop drawing. Changes (revisions) to re-submitted shop drawings must be clearly encircled or otherwise highlighted.

I. 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.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with "A - APPROVED" or "B - APPROVED AS NOTED" from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

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

1. Web-Based Project Management Software: Prepare submittals in PDF form and upload web-based Project management software website. Enter data in web-based software site to fully identify submittal.
2. 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.

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

2.2 ACTION SUBMITTALS

A. The following items will receive "A", "B", "C", and "D" actions.

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

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable. . Delete or mark out extraneous material that is not applicable to the Work. Edit material to conform to project requirements, and to clearly show model number, type and size proposed. Provide additional information as necessary to supplement standard information. Product data sheets that are submitted with extraneous information not deleted and/or modified to indicate requirements will be returned to the Contractor without review.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Manufacturer's written recommendations and installation instructions.
    d. Standard color charts.
    e. Mill reports.
    f. Statement of compliance with specified referenced standards.
    g. Testing by recognized testing agency.
    h. Application of testing agency labels and seals.
    i. Notation of coordination requirements.
    j. 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. Standard product operating and maintenance manuals.
    e. Compliance with recognized trade association standards.
    f. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Modify Product Data sheets to delete information which is not applicable to the Work. Edit all material to conform to job requirements, and to clearly show model number, type or size proposed. Provide additional information, if necessary, to supplement standard information. Product data sheets that are submitted with extraneous information not deleted and/or modified will be returned to the Contractor without review.
6. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed by the Contractor.
7. Submit Product Data before or concurrent with Samples.
8. Submit Product Data in the following format:

    a. PDF electronic file.

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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. General: Submittals containing reproduction of Contract Drawings are not considered Shop Drawings and will be returned without action. Any delay due to such rejection will not be grounds for an extension of Contract Time.
2. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Dimensions
    b. Identification of products.
    c. Schedules.
    d. Compliance with specified standards.
    e. Notation of coordination requirements.
    f. Notation of dimensions established by field measurement.
    g. Relationship and attachment to adjoining construction clearly indicated.
    h. Fabrication and installation drawings.
    i. Roughing-in and setting diagrams.
    j. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring. Differentiate between manufacturer installed and field installed wiring.
    k. Shop fabrication instructions.
    l. Templates and patterns.
    m. Design Calculations with seal and signature of professional engineer if specified.
    n. Highlight deviations from the Contract Documents.

3. Number each shop drawing sheet uniquely complying with file numbering system specified.
4. Do not use Shop Drawings for ordering, fabrication, or construction without an appropriate final stamp from the Contractor,and Architect indicating action taken in connection with construction.
5. Submit Shop Drawings in the following format:

    a. PDF electronic file.

6. BIM File Incorporation: Develop and incorporate Shop Drawing files into BIM established for Project.

    a. Prepare Shop Drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.
    b. Refer to Division 01 Section "Project Management and Coordination" for requirements for coordination drawings.

D. Samples: Submit Samples required by the technical sections of the specifications, for review of size, kind, color, pattern, and texture for a check of these characteristics with other materials and for a comparison of these characteristics between final submittal and actual component as delivered and installed.

1. Submit Samples also for:

    a. Comparable products.
    b. Substitutions.
    c. Custom fabricated items.
    d. Custom Colors.

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e. When the specified item is no longer available, the manufacturer's current catalog numbers vary from those specified, or named manufacturer's product data differs from requirements specified.

2. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
3. Identification: Mount, or display, Samples to facilitate review of qualities specified. Prepare Samples to match the Architect's sample. Permanently attach label on unexposed side of samples that includes the following:

   a. Product name, manufacturer name, and submittal number
   b. Generic description of Sample.
   c. Sample source.
   d. Number and title of applicable Specification Section.
   e. Specification paragraph number, submittal number, and generic name of each item.
   f. Compliance with recognized standards.
   g. Availability and delivery time.

4. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
5. Electronic Submittals: 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.
6. 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.

7. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available. Color charts shall show actual colors-- photographic representations or reproductions will not be accepted.

   a. Number of Samples: Submit two (2) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

8. 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.

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a. Number of Samples: Submit three (3) sets of Samples. Architect will retain two (2) Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three(3) sets of paired units that show approximate limits of variations.

2.3 INFORMATIONAL SUBMITTALS

A. The following items will receive "E", “F,” or "G" action.

B. Contractor’s Submittal Schedule: Comply with requirements specified in this Section under article "SUBMITTAL ADMINISTRATIVE REQUIREMENTS".

C. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

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

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

a. PDF electronic file.

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

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Include energy calculations if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates and Certifications:

1. General: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

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3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B21,/B2.1M Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Test, Research, and Inspection Reports

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers and needed for adhesion.
2. Field 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.

    a. Inspection Schedule Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

7. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

    a. Name, address, and telephone number of factory-authorized service representative making report.
    b. Statement on condition of substrates and their acceptability for installation of product.

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c. Statement that products at Project site comply with requirements.
d. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
e. Results of operational and other tests and a statement of whether observed performance complies with requirements.
f. Statement whether conditions, products, and installation will affect warranty.
g. Other required items indicated in individual Specification Sections.

8. Inspection Reports: For Inspections required by the Contractor as specified in technical sections of the specifications and Division 01 "Quality Requirements".

2.4 SUSTAINABILITY SUBMITTALS

A. Actionable Sustainability Submittals: Comply with requirements specified in Division 01 Section "Sustainable Design Requirements".

1. Number of Copies: Submit three copies of sustainable design submittals, unless otherwise indicated (use only for paper copies)
2. Submit sustainable design submittals in the following format:

a. PDF electronic file.

3. Sustainable design Submittals shall be processed at the same time and as part of other submittals required in this Section. Submittals that are received without sustainable design documentation shall be considered partial submittals and shall not be given either an "A" or "B" action.

a. If partial submittals have received an "A" or "B" action and the sustainable design Submittal does not provide compliance with later received sustainable design requirements, that action may be overturned.

B. Informational Sustainability Submittals: The following certifications and statements are for information purposes only and will receive "E" and" F", and “G” actions.

1. Third party certifications
2. Corporate Sustainability Reporting (CSR)
3. Extended Producer Responsibility
4. Cradle-to-Cradle Certification (C2C)
5. Environmental Product Declaration (EPD)

C. Sustainability Submittals for Declaration Purposes: Product Optimization submittals for declaration purposes are requested strictly for the purpose of compliance with requirements of the sustainable design certification program. The Contractor shall file them directly with the program. Their content will not be reviewed, and their submittal will be actioned "Not Reviewed". These include:

1. Health Product Declaration (HPD)
2. Certifications that contain chemical precautions.

D. Safety Data Sheets (SDSs): Not a required submittal, nor subject to Architect’s review or approval, since Contractor remains solely responsible for job site safety controls, procedures, and programs.

1. Retain SDSs for Contractor’s Safety Program at Project site; do not submit to Architect.

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a. Architect will not review SDSs for conformance with the specifications and will return without an action.

2.5 CLOSEOUT SUBMITTALS

A. General: The following closeout submittals complement the closeout requirements specified in Division 01 Section "Closeout Procedures."

B. Closeout Submittals and Maintenance Material Submittals: Provide copies of final approved shop drawings, accepted substitutions, and copies of other final submittals specified in this section with a record copy to the Owner at Substantial Completion. Comply with requirements specified in Division 01 Section "Closeout Procedures."

C. Project Record Documents: Comply with requirements specified in Division 01 Section "Project Record Documents.", for provision of "As-Built Drawings" for incorporation in Project Record Documents.

D. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

E. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

F. Final Completion Construction Photographs: Arrange with Owner, Subcontractors, Consultants, and other interested parties for photographs of the finished construction. Provide at a minimum,; interior finishes and notable portions of the building. When requested by the Owner, take photographs of adjacent buildings to document condition at the end of construction. (see 1.3B for Preconstruction photos)

2.6 FABRICATION ENGINEERING AND DESIGN SERVICES

A. Fabrication Engineering and Design: When identified in the Contract Documents, are required for components related to systems, materials, or equipment to the Contractor.

1. The Architect's Drawings may be diagrammatic, may not identify or imply solutions, but are intended to show the:

    a. Design intent, profiles and overall dimensions, shapes, and forms,
    b. Materials and relationships between items,
    c. Location, identification of assemblies, components, accessories, and other items,
    d. Schematic attachment details and diagrams of connections.

2. The Architect's Specifications will identify performance criteria required.

    a. If performance criteria specified or indicated are insufficient to perform services, submit a written request for additional information to Architect.

B. Contractor's Responsibility: Engage an engineering professional complying with requirements specified in the Quality Assurance Article to provide fabrication engineering and design services; including but not limited to, signed and sealed shop drawings, product data and calculations using the design criteria, performance requirements, and other requirements specified in the Contract Documents. Be responsible for the following:

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1. Maintaining design intent, conforming to the design shown on the Drawings and the performance requirements in the Specifications.
2. Providing fabrication engineering and design of assemblies including materials, products, components, and accessories required for a complete design, whether such items are indicated on the Drawings or in the Specifications.
3. Providing anchors, attachments, inserts, fasteners, clips, bracing, framework, connections, and similar items required to comply with specified design performance requirements.
4. Securely attaching Work to adjacent supports, related adjoining work; whether such items are indicated on the Drawings or in the Specifications.

C. Deviations: In the interest of certain fabrication or erection methods, minor dimensional changes and detailing adjustments to the original design communicated in the Contract Documents may become necessary.

1. Identify proposed changes and deviations clearly in the Submittal, highlighting items and bringing deviations to the Architect's attention for review.

D. Fabrication Engineer and Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed and sealed PDF electronic Shop Drawings, Product Data, engineering and design calculation files and other required submittals, signed and sealed by the qualified Professional Engineer responsible for preparation of fabrication engineering and design services.

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.

E. Substituted Engineering: The Architect has provided engineering design for elements of the Project based on design criteria, performance specifications, and other requirements as documented in the Contract Documents.

1. Where Contractor proposes to vary from the engineering design indicated in the Contract Documents, the Contractor shall engage a Professional Engineer licensed to practice in the project jurisdiction, to provide engineering and design and be the Engineer of record for those components that are substituted engineering design.
2. Submittals for substituted engineering shall comply with processes outlined in Division 01 Substitutions.
3. If performance criteria indicated are not sufficient to perform services, submit a written request for additional information to Architect.

F. BIM File Incorporation: Incorporate fabrication engineering and design drawing and data files into Building Information Model established for Project.

1. Prepare fabrication engineering and design drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

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1. Compliance with specified characteristics is the Contractor's responsibility.
2. Ensure submittal is specifically required by the Contract Documents. Submittals not required shall not be submitted and will not be processed or reviewed by the Architect.
3. Verify:

    a. Field measurements.
    b. Field construction criteria.
    c. Catalog numbers and similar data.
    d. Proper interface with adjacent or related work.

4. Coordinate each submittal with adjacent work and requirements of Contract Documents.
5. Coordinate each submittal with previous transmittal requirements for numbering each submittal.
6. Each specified material, product, or item shall be submitted individually, as a separate, uniquely identified submittal complying with file numbering system specified. Assembled booklets containing multiple products or systems from different sections will not be permitted and will be returned without action.

B. Contractor's Review/Approval Stamp: Insert a uniform, approval stamp on each submittal. 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.

1. Language on the Contractor's submittal review stamp shall be consistent with the Agreement and requirements of the General Conditions of the Contract for Construction. A stamp containing language which defers or assigns Contractor's responsibilities to subcontractor will not be permitted.
2. Contractor’s Review Stamp shall include notation on each submittal, "I affirmatively state that there are no material deviations from the requirements of the Contract Documents."
3. Architect will not review submittals from the Contractor that do not have the Contractor's stamp.
4. Any delay due to such rejections will not be grounds for an extension of time.

C. Processing of Submittals to the Architect is an acknowledgement that the Contractor/CM has reviewed submittal against the Contract Documents the work of other trades and fully coordinated work shown on the submittal, whether or not it contains a Contractor's stamp

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

1. Submittals will be reviewed for architectural design conformity and general conformance with the Contract Documents only. The Contractor is responsible for confirming and correlating dimensions at job sites for tolerances, clearances, quantities, fabrication processes and techniques of construction, coordination of their Work with other trades and full compliance with the Contract Documents.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it Architect will insert an action stamp on each submittal, marked appropriately to indicate required action, as follows:

1. A - APPROVED: Submittal has been reviewed for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract

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Documents and no exceptions are taken. Proceed with work represented in Submittal. Architect's review is not for determining the accuracy or completeness of other details, such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment and systems, remain the responsibility of the Contractor. Review shall not constitute approval of safety precautions, or of construction means, methods and techniques, sequences, or procedures. Approval of a specific item shall not indicate approval of an assembly of which the item is a component. Comments and corrections do not authorize changes to the Contract Documents.

2. B - APPROVED AS NOTED: Submittal has been reviewed as stated in Subparagraph 1, above, but certain exceptions are noted. Contractor may proceed with work represented in submittal, provided Contractor agrees to incorporate comments and corrections noted by Architect. Resubmittal is not required. Comments do not authorize changes to Contract Documents.
3. C - REVISE AS NOTED & RESUBMIT: Submittal has been reviewed as stated in Subparagraph 1, above, but certain comments and corrections are noted, that as a minimum, are necessary for conformance with the design concept expressed in the Contract Documents. Do not proceed with the Work covered by this Submittal. Revise Submittal responding to comments and corrections and resubmit to Architect for review until "APPROVED" or "APPROVED AS NOTED" action is given. In resubmissions, limit corrections made to items noted in this Submittal.
4. D - REJECTED: Submittal has been reviewed as stated in Subparagraph 1, above and is not acceptable. Do not proceed with Work covered in this Submittal, for one or more of the following reasons:

    a. Work represented in Submittal does not fulfill the requirements of the Contract Documents; submit specified item.
    b. Submittal has not been made in accordance with procedures specified.
    c. Insufficient and incomplete information is provided; accurate determination is not possible.
    d. Submittal contains errors or omissions; accurate determination is not possible.
    e. Information provided does not conform to information included in the Contract Documents.
    f. Submittal contains extraneous materials; accurate determination is not possible.

C. Informational Submittals: Architect is not required to review each submittal and will not return it, or will return it if it does not comply with requirements and contradictions are discovered. Architect will forward each submittal to appropriate party, with actions as follows:

1. E – REVIEWED FOR INFORMATION: Submittal has been processed for information only.
2. F – REVIEWED FOR INFORMATION AS NOTED: Submittal has been processed and has been found to contain discrepancies noted. Contractor may proceed, provided Contractor agrees to incorporate comments noted. Resubmit only if noted in this submittal.
3. G - REVISE AS NOTED FOR INFORMATION AND RESUBMIT: Submittal has been processed and found to contain discrepancies which need to be addressed before the Contractor can proceed. Revise and resubmit addressing items noted until an "E" or "F" action is given.

D. Fabrication Engineering and Design Review: The Architect is entitled to rely upon the adequacy, accuracy and completeness of engineering provided by the Contractor and the Contractor's Engineering Professional. The Architect's review of these submittals shall be limited to verification that the Contractor's fabrication engineering documents:

1. Are in general conformance with the design intent, including design criteria, performance requirements contained in technical sections of the specifications, and other requirements of the Contract Documents

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2. Are in general conformance with the overall Project Design, and
3. Can be integrated into the overall Project Design.

E. HPD Sustainability Submittals for Declaration Purposes: Sustainability Submittals for declaration of material ingredients will receive the following action:

1. NOT REVIEWED: This document is for declaration purposes only. Document is for Owner's record of materials used on the project. The Architect does not have the expertise to evaluate documentation pertaining to a building product's medical or health effects. This document was received on behalf of the Owner and is passed-through to the Owner for the Owner's information, review, and use. THE OWNER IS ADVISED THAT CERTAIN HAZARDOUS SUBSTANCES (INCLUDING KNOWN CARCINOGENS) MAY BE DISCLOSED IN THE ATTACHED INFORMATION. Determination of whether an actual hazard exists is a fact-based analysis requiring the expertise of appropriate scientists and/or toxicologists; all of which is beyond the expertise of the Architect. The Owner is advised to retain appropriate experts to review the information provided herein and to take appropriate actions including recommending necessary and appropriate safety guidelines for use of this product.

F. Partial submittals prepared for a portion of the Work will be reviewed only when use of partial submittals has received prior approval from Architect. Partial submittals not authorized will be returned with no action taken. Delays caused by non-compliance with the requirement to submit combined submittals for each section, shall be the Contractor's responsibility.

G. Incomplete submittals and submittals with errors are unacceptable, will be considered nonresponsive to requirements of the Contract Documents, and will be returned for resubmittal with a NOT REVIEWED stamp.

H. Architect will return without review or discard submittals received from sources other than Contractor.

I. Submittals not required by the Contract Documents or submittals that include manufacturer's instructions to the Contractor relative to Contractor's responsibility for means, methods, procedures, and safety precautions, may be returned or discarded by the Architect without action.

END OF SECTION 013300

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SECTION 014000 – QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Administrative and procedural requirements for quality assurance and quality control.
2. Testing and inspection services are required to verify compliance with requirements specified or indicated.

    a. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.

3. Specific quality-assurance and quality-control requirements for individual work results are included in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.

    a. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Requirements:

1. Division 01 Section “Mockups.”
2. Divisions 02 through 33 sections for specific test and inspection requirements.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with

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specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" shall have the same meaning as the term "testing agency."

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

I. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.3 FABRICATION ENGINEERING AND 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. Fabrication Engineering and Design Services Statement: 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.

1.4 CONFLICTING REQUIREMENTS

A. General: The Contract Documents are complementary. What is required by one shall be as binding as if required by all.

1. Submit apparent conflicts to the A/E for resolution prior to proceeding. Work performed without the A/E's determination shall be at the Contractor's risk.

B. Conflicts Discovered Prior to Bid:

1. Conflicts Within Contract Documents between Disciplines: Every reasonable effort has been made to coordinate the Contract Documents of disciplines involved.

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a. Examine the Contract Documents of disciplines to determine that coordination is satisfactory.
b. Bring apparent conflicts to the attention of the Architect/Engineer for resolution prior to award of the Contract.

2. Quantities: In some instances, the Contract Documents may be diagrammatic in nature and show scope without explicitly indicating precise quantities and sizes of items.

a. Provide materials of the size and quantity necessary to accomplish the Work and satisfy performance criteria.
b. If sizes, quantities and/or performance criteria critical to the formulation of a bid cannot be reasonably inferred from the Contract request a clarification from the Architect/Engineer.

3. Dimensions: Where, in the opinion of the Contractor, the Contract Documents lack dimensional information or contain dimensional conflicts that are critical to the formulation of a bid proposal or the execution of the Work, the Contractor shall request a clarification from the Architect/Engineer prior to proceeding with the work.

C. Conflict Discovered After Contract Award:

1. In case of conflict or inconsistency between Drawings and specifications, the Contractor shall request additional information or interpretation as specified in Division 01 Section “Project Management and Coordination.”
2. Any adjustment made by the Contractor without such determination shall be at their own risk and expense.

D. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

E. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

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

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

1. Specification Section number and title.

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

E. Reports: Prepare and submit certified written reports and documents as specified.

F. Permits, Licenses, and Certificates: For Owner's record, 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 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager shall not have other Project responsibilities.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by Commissioning Authority.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.

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F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

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1.8 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged in the activities indicated.

   1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

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

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

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1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection 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. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Commissioning Authority, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's

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services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives 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 inspection. 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 inspection equipment at Project site.

H. 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 inspection.

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

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.

1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
2. Distribution: Distribute schedule to Owner, Architect, Commissioning Authority, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.10 SPECIAL TESTS AND INSPECTIONS

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

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

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5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, and authorities' having jurisdiction reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

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

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

END OF SECTION 014000

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SECTION 014200 – REFERENCES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

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": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 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.

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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 Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

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. Abbreviations and acronyms not included in this list shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States." The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).

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31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CE - Conformite Europeenne; http://ec.europa.eu/growth/single-market/ce-marking/.
51. CEA - Canadian Electricity Association; www.electricity.ca.
52. CEA - Consumer Electronics Association; www.ce.org.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.pbmdf.com.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - CSA Group; www.csagroup.com.
65. CSA - CSA International; www.csa-international.org.
66. CSI - Construction Specifications Institute (The); www.csinet.org.
67. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
71. DHI - Door and Hardware Institute; www.dhi.org.
72. ECA - Electronic Components Association; (See ECIA).
73. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
74. ECIA - Electronic Components Industry Association; www.eciaonline.org.
75. EIA - Electronic Industries Alliance; (See TIA).
76. EIMA - EIFS Industry Members Association; www.eima.com.
77. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
78. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
79. ESTA - Entertainment Services and Technology Association; (See PLASA).
80. ETL - Intertek (See Intertek); www.intertek.com.

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81. EVO - Efficiency Valuation Organization; www.evo-world.org.
82. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
83. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
84. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
85. FM Approvals - FM Approvals LLC; www.fmglobal.com.
86. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
87. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
88. FSA - Fluid Sealing Association; www.fluidsealing.com.
89. FSC - Forest Stewardship Council U.S.; www.fscus.org.
90. GA - Gypsum Association; www.gypsum.org.
91. GANA - Glass Association of North America; www.glasswebsite.com.
92. GS - Green Seal; www.greenseal.org.
93. HI - Hydraulic Institute; www.pumps.org.
94. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
95. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
96. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
97. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
98. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
99. IAS - International Accreditation Service; www.iasonline.org.
100. ICBO - International Conference of Building Officials; (See ICC).
101. ICC - International Code Council; www.iccsafe.org.
102. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
103. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
104. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
105. IEC - International Electrotechnical Commission; www.iec.ch.
106. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
107. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
108. IESNA - Illuminating Engineering Society of North America; (See IES).
109. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
110. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
111. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
112. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
113. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
114. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
115. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
116. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
117. ISO - International Organization for Standardization; www.iso.org.
118. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
119. ITU - International Telecommunication Union; www.itu.int/home.
120. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
121. LMA - Laminating Materials Association; (See CPA).
122. LPI - Lightning Protection Institute; www.lightning.org.
123. MBMA - Metal Building Manufacturers Association; www.mbma.com.
124. MCA - Metal Construction Association; www.metalconstruction.org.
125. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
126. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
127. MHIA - Material Handling Industry of America; www.mhia.org.
128. MIA - Marble Institute of America; www.marble-institute.com.

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129. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
130. MPI - Master Painters Institute; www.paintinfo.com.
131. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
132. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
133. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
134. NADCA - National Air Duct Cleaners Association; www.nadca.com.
135. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
136. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
137. NBI - New Buildings Institute; www.newbuildings.org.
138. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
139. NCMA - National Concrete Masonry Association; www.ncma.org.
140. NEBB - National Environmental Balancing Bureau; www.nebb.org.
141. NECA - National Electrical Contractors Association; www.necanet.org.
142. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
143. NEMA - National Electrical Manufacturers Association; www.nema.org.
144. NETA - InterNational Electrical Testing Association; www.netaworld.org.
145. NFHS - National Federation of State High School Associations; www.nfhs.org.
146. NFPA - National Fire Protection Association; www.nfpa.org.
147. NFPA - NFPA International; (See NFPA).
148. NFRC - National Fenestration Rating Council; www.nfrc.org.
149. NHLA - National Hardwood Lumber Association; www.nhla.com.
150. NLGA - National Lumber Grades Authority; www.nlga.org.
151. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
152. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
153. NRCA - National Roofing Contractors Association; www.nrca.net.
154. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
155. NSF - NSF International; www.nsf.org.
156. NSPE - National Society of Professional Engineers; www.nspe.org.
157. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
158. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
159. NWFA - National Wood Flooring Association; www.nwfa.org.
160. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
161. PDI - Plumbing & Drainage Institute; www.pdionline.org.
162. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
163. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
164. RFCI - Resilient Floor Covering Institute; www.rfci.com.
165. RIS - Redwood Inspection Service; www.redwoodinspection.com.
166. SAE - SAE International; www.sae.org.
167. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
168. SDI - Steel Deck Institute; www.sdi.org.
169. SDI - Steel Door Institute; www.steeldoor.org.
170. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
171. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
172. SIA - Security Industry Association; www.siaonline.org.
173. SJI - Steel Joist Institute; www.steeljoist.org.
174. SMA - Screen Manufacturers Association; www.smainfo.org.
175. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
176. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
177. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
178. SPIB - Southern Pine Inspection Bureau; www.spib.org.

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179. SPRI - Single Ply Roofing Industry; www.spri.org.
180. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
181. SSINA - Specialty Steel Industry of North America; www.ssina.com.
182. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
183. STI - Steel Tank Institute; www.steeltank.com.
184. SWI - Steel Window Institute; www.steelwindows.com.
185. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
186. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
187. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
188. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
189. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
190. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
191. TMS - The Masonry Society; www.masonrysociety.org.
192. TPI - Truss Plate Institute; www.tpinst.org.
193. TPI - Turfgrass Producers International; www.turfgrasssod.org.
194. TRI - Tile Roofing Institute; www.tileroofing.org.
195. UL - Underwriters Laboratories Inc.; www.ul.com.
196. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
197. USAV - USA Volleyball; www.usavolleyball.org.
198. USGBC - U.S. Green Building Council; www.usgbc.org.
199. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
200. WA - Wallcoverings Association; www.wallcoverings.org.
201. WASTEC - Waste Equipment Technology Association; www.wastec.org.
202. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
203. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
204. WDMA - Window & Door Manufacturers Association; www.wdma.com.
205. WI - Woodwork Institute; www.wicnet.org.
206. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
207. WWPA - Western Wood Products Association; www.wwpa.org.

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. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

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. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.

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8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

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. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.

    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.

6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

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. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.

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7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

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SECTION 014339 - MOCKUPS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Integrated exterior mockups.
2. Room mockups in area(s) designated on Drawings.

C. Related Requirements:

1. Division 01 Section "Quality Requirements" for quality assurance requirements for aesthetic and workmanship mockups specified in other Sections.

1.2 DEFINITIONS

A. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as part of permanent construction, consisting of multiple products, assemblies, and subassemblies.

B. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting as indicated.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, testing and inspecting agency representative, and installers of major systems whose Work is included in integrated exterior and room mockups.
2. Review coordination of equipment and furnishings provided by the Owner for room mockups.
3. Review locations and extent of mockups.
4. Review testing procedures to be performed on mockups.
5. Review and finalize schedule for mockups, and verify availability of materials, personnel, equipment, and facilities needed to complete mockups and testing and maintain schedule for the Work.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior and room mockups.

1. Include plans, elevations, sections, and mounting attachment and support details.
2. Indicate manufacturer and model number of individual components, subassemblies, and assemblies.
3. Include site location drawing.

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4. Revise and resubmit Shop Drawings to reflect approved modifications in details and component interfaces resulting from changes made during testing procedures.

1.5 INFORMATIONAL SUBMITTALS

A. Room Mockup Coordination Drawings: Include plans, elevations, 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, and as applicable to type of space:

1. Casework.
2. Equipment.
3. Furniture.

B. Qualification Data: For testing agency.

C. Preconstruction Test Reports: For preconstruction laboratory mockups.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025 and acceptable to Owner and Architect.

B. Build mockups to do the following:

1. Verify selections made under Sample submittals.
2. Demonstrate aesthetic effects.
3. Demonstrate the qualities of products and workmanship.
4. Demonstrate acceptable coordination between components and systems.
5. Perform preconstruction testing, such as window air- and water-infiltration testing.

C. Fabrication: Before fabricating or installing portions of the Work requiring mockups, build mockups for each form of construction and finish required. Use materials and installation methods as required for the Work.

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
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.

D. Notifications:

1. Notify Architect seven days in advance of the dates and times when mockups will be constructed.
2. Notify Architect 14 days in advance of the dates and times when mockups will be tested.
3. Allow seven days for initial review and each re-review of each mockup.

E. Approval: Obtain Architect's approval of mockups before starting fabrication or construction of corresponding Work.

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1. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 COORDINATION

A. Coordinate schedule for construction of mockups, so construction, testing, and review of mockups do not impact Project schedule.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Mockup Testing Performance Requirements: Perform tests using design pressures and performance criteria indicated for assemblies and products that are specified in other Sections and incorporated into integrated exterior mockups.

2.2 INTEGRATED EXTERIOR MOCKUPS

A. Construct integrated exterior mockups as indicated on Drawings. Construct mockups to demonstrate constructability, coordination of trades, and sequencing of Work; and to ensure materials, components, subassemblies, assemblies, and interfaces integrate into a system complying with indicated performance and aesthetic requirements.

B. Design and construct foundation and superstructure to support free-standing integrated exterior mockups.

C. Build integrated exterior mockups using installers and construction methods that will be used in completed construction.

D. Use specified products that have been approved by the Architect. Coordinate installation of materials and products specified in individual Specification Sections that include Work included in integrated exterior mockups.

E. The Work of integrated exterior mockups includes, but is not limited to, the following:

1. Cementitious wall panels (UHPC).
2. Masonry veneer.
3. Cold-formed metal framing and sheathing.
4. Air and weather barriers.
5. Thermal insulation.
6. Through-wall flashing.
7. Flashing and sheet metal trim.
8. Joint sealants.
9. Metal wall panels.
10. Aluminum-framed entrances and storefront.
11. Glazed curtain walls.
12. Aluminum windows.

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13. Glazing.

F. Photographic Documentation: Document construction of integrated exterior mockups with photographs in accordance with Section 013233 "Photographic Documentation." Provide photographs showing details of interface of different materials and assemblies.

1. Document testing procedures, including water leakage and other deficiencies. Photograph modifications to component interfaces intended to correct deficiencies.

G. Provide and document modifications to construction details and interfaces between components and systems required to properly sequence the Work, or to pass performance testing requirements. Obtain Architect's approval for modifications.

H. Retain approved mockups constructed in place. Incorporate fully into the Work.

2.3 ROOM MOCKUPS

A. Build room mockups according to approved mockup Shop Drawings to evaluate constructability, demonstrate the coordination of trades and sequencing of Work, and to demonstrate aesthetic requirements. Include each visible finish, component, and equipment item within room mockups; include operable lighting.

B. Provide room mockups of the following rooms:

1. Typical Clinic Exam Room (Level 1).

C. The work of room mockups includes, but is not limited to, the following:

1. Millwork and casework.
2. Doors and frames.
3. Access doors and frames.
4. Glazing.
5. Metal framing.
6. Gypsum board.
7. Ceramic tiling.
8. Acoustical ceilings.
9. Resilient flooring.
10. Carpeting.
11. Painting.
12. HVAC diffusers, registers, and grilles.
13. Wiring devices.
14. Lighting.

PART 3 - EXECUTION

3.1 TESTING OF INTEGRATED EXTERIOR MOCKUPS

A. Integrated Exterior Mockup Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Testing and inspecting agency will interpret tests and state in each report whether tested Work complies with or deviates from requirements.

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B. Integrated Exterior Mockup Testing Services: Perform the following tests in the following order:

1. Water-Spray Test: Before installation of interior finishes has begun, test areas designated by Architect in accordance with AAMA 501.2 for evidence of water penetration.

   a. Perform a minimum of three tests in areas as directed by Architect.

2. Air Leakage: Test in accordance with ASTM E783 at 1.5 times the rate specified in "Mockup Testing Performance Requirements" Paragraph in "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

   a. Perform a minimum of three tests in areas as directed by Architect.

3. Water Penetration: Test in accordance with ASTM E1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Mockup Testing Performance Requirements" Paragraph in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. (300 Pa), and verify no evidence of water penetration.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and installations, including connections, and also to observe testing for the following systems and assemblies.

1. Curtain wall specified in Division 08 Section "Glazed Aluminum Curtain Walls."

D. Integrated exterior mockup will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 014339

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SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Requirements for temporary utilities, support facilities, and security and protection facilities.
2. Nothing in this section is intended to limit type and amounts of temporary work required, and no omission from this section will be recognized as an indication that such temporary activity is not required for successful completion of the work and compliance with requirements of the Contract Documents.

C. Related Requirements:

1. Division 01 Section "Summary" for work restrictions and limitations on utility and facility services interruptions.

1.2 DEFINITIONS

A. Permanent Enclosure: As determined by Architect/Engineer, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and openings are closed and fully protected.

1.3 USE CHARGES

A. General: Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

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

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

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

1.4 INFORMATIONAL SUBMITTALS

A. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility and facility service.

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

C. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.
4. Show plan to protect newly installed materials or existing slabs, including roof deck, from moisture intrusion until the installation of finish materials or roof coverings.

D. 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.

E. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:

1. Methods used to meet the goals and requirements of the Owner.
2. Concrete cutting method(s) to be used.
3. Location of construction devices on the site.
4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
6. Indicate locations of sensitive equipment areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

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 and facility service before use. Obtain required certifications and permits.

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C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

D. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including, but not limited to, the following:

1. Building Code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, Fire Department and Rescue Squad rules.

E. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.

1.6 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.

1. 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.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat
2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect/Engineer. Provide materials suitable for use intended.

B. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.

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

D. Noise Control Temporary Barriers: weather resistant, noise control panels with minimum 10 dB noise reduction, or more if required by local authorities.

E. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C36.

F. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

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G. Paint: Comply with requirements in Division 9 Sections "Exterior Painting" and "Interior Painting."

H. Water: Potable.

2.2 TEMPORARY FACILITIES

A. Use in-place Contractor's temporary facilities to the greatest extent practicable.

B. 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: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

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, Cooling, and Dehumidifying 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.

D. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

E. Power Distribution System Circuits: Where permitted and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

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PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

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

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 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 and in-place construction disturbance as specified in Division 01 Section "Summary."

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

C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.

a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.3 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Use in-place field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
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.

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B. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

C. 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.

D. Temporary Elevator Use: Coordinate with Owner.

E. Janitorial Services: Provide janitorial services on a daily basis for temporary offices, first-aid stations, toilets, wash facilities, lunchrooms, and similar areas.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect in-place 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 in-place 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 Division 01 Section "Summary."

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

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

E. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

F. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

G. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard, with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.

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a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.

3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
4. Insulate partitions to control noise transmission to occupied areas.
5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
6. Protect air-handling equipment.
7. Provide walk-off mats at each entrance through temporary partition.

H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

a. Establish required time to maintain firewatch after all welding operations and other “hot work” occurring on job site.

3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
5. Provide fully functioning permanent fire suppression sprinkler system at earliest possible date, including modifications to existing systems where applicable.
6. Comply with Owner’s Interior Life Safety Measures (ILSM) at all times.

3.5 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

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C. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 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.

    a. Maintain temporary signage provided by Owner.

C. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

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

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

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END OF SECTION 015000

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SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Labor, materials, equipment, tools, services and miscellaneous and incidental work to provide tree protection and relocation as indicated on Drawings and as specified in this Section.

    a. Protection and welfare of all existing trees within the Contract Limits which are noted to remain, including trimming, cabling, and repair of such trees as necessary to box, move, store, maintain and transplant trees which have been designated for relocation on the Drawings and as specified.
    b. Submit a Tree Protection Plan for the Owner's approval.
    c. Protection of any existing irrigation system servicing trees to remain.
    d. Completely coordinate with all work pertaining to the job site and overall project.

1.2 REFERENCES

A. Reference Standards:

Reference	Title
ISA, International Society of Arboriculture	"Guide for Establishing Values of Trees and Other Plants", prepared by the Council of Tree and Landscape Appraisers (CTLA).
NAA, National Arborist Association	"Cabling, Bracing and Guying Standards for Shade Trees," 174 RT 101, Bedford, New Hampshire, 03102.
ASTM F 1292	Standard Specification for Impact Attenuation of Surfacing Materials within the Use Zone of Playground Equipment.

1.3 DEFINITIONS

A. "Injury" is defined, without limitation, as any bruising, scarring, tearing, or breaking of roots, branches, or trunk.

B. "Drip line" is defined as the outermost limits of the tree canopy.

1.4 QUALITY ASSURANCE

A. General Responsibility: The Contractor shall be directly responsible for protection and welfare of existing trees within the Contract Limits which are noted to remain. This responsibility shall

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continue throughout the full construction period until the entire project is completed and accepted by the Owner and through completion of the guarantee period.

B. Qualifications of Workmen: Trimming shall be performed only by a licensed arborist. Provide at least one person approved by the Owner who shall be present at all times during tree protection and trimming operations, who shall be thoroughly familiar with the type of work involved, and who shall direct all protection and trimming work.

1.5 FIELD CONDITIONS

A. Prior to performing any work of this Contract, Contractor shall call for a site meeting with the Owner and/or the Engineer. This meeting shall occur prior to construction of any nature on site and may take place at the time of the preconstruction meeting. The purpose of the meeting shall be to discuss/review the Tree Protection Plan as prepared by, or under the direction of, the Contractor.

B. Sequencing Schedule: Coordinate and cooperate with other trades to enable the work to proceed as rapidly and efficiently as possible.

1.6 GUARANTEE

A. Contractor shall guarantee that all plants covered by the provisions of this Section will be healthy and in flourishing condition of active growth one year from the date of Final Completion.

B. During the warranty period the Contractor shall be liable for damages to all trees covered by the provisions of this Section and shall pay compensation to the Owner.

C. Contractor will not be held responsible for failures due to neglect by the Owner, vandalism, etc. during the warranty period. Report such conditions to the Owner.

PART 2 - PRODUCTS

2.1 TREE PROTECTION MEASURES

A. Tree Protection Measures are to be shown on the Tree Protection Plan. The Contractor shall utilize measures in such a way to ensure the survival, protection, and overall health of all existing trees to remain.

B. Fencing:

1. Tree Protection Fence: Four-foot high chain link fence, sturdy and capable of acting as a barrier against objects, vehicles, etc., and designed so as to allow for relocations as required and shall have gate access to inside for care of tree. It shall be continuously maintained and repaired as necessary. Metal shall be galvanized.
2. Install tree protection fencing around trees to be preserved at a distance required from the base of the trunk to one-foot outside the drip line of the tree. Fencing shall remain until site work has commenced, and it shall then be removed as directed by the Owner.
3. During the course of construction, relocation of the fence may be required to facilitate construction. The Contractor shall do so as directed by the Owner at no additional expense to the Owner.

C. Protective Mulch: Used to prevent compaction of the rootzone.

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1. Protective mulch shall be engineered wood fiber comprised of softwoods and/or hardwoods, consisting of randomly sized wood fibers for majority of which do not exceed 1.5 inches in length.
2. Protective mulch shall be non-toxic. It may not contain any recycled wood products or any wood containing paint, chemicals or additives.
3. Protective mulch shall have minimal bark and to be free of twigs, leaf debris and other organic material, and to be certified as non-flammable.
4. Protective mulch depth, after installation, must be in accordance with the procedure described in ASTM F-1292.

D. Protective Fabric: Used to prevent rutting and potholes.

1. The composite turf reinforcement mat shall be a machine-produced fiber matrix incorporated into permanent three-dimensional turf reinforcement matting.
2. The fiber matrix material shall be one of the following:

    a. UV stabilized polypropylene
    b. Coconut fiber

3. The matrix shall be evenly distributed across the entire width of the matting, stitch bonded between the bottom and middle nettings and then covered by a heavy-duty UV stabilized top net. The corrugated netting shall form prominent closely-spaced ridges across the entire width of the mat. The tree nettings shall be stitched together on two-inch center maximum with UV stabilized polypropylene thread to form a permanent three-dimensional turf reinforcement matting.
4. Installation staple patterns shall be clearly marked on the turf reinforcement mattings with environmentally safe paint. All mats shall be manufactured with a colored thread stitched along both outer edges (approximately 2 to 5 inches from the edge) as an overlap guide for adjacent mats.
5. The permanent composite turf reinforcement nettings (top and bottom) shall be heavy-duty UV stabilized polypropylene 8.00 lbs/1000 ft^2, minimum.

E. Logging Mats - used to prevent compaction of the rootzone.

1. Logging mats shall be constructed of oak or a hardwood with similar strength and structural tendencies.
2. Timbers shall be bolted together with 1-1/4-inch steel rods, countersunk.
3. Ends of timbers shall be anchor-seal coated to prevent splitting and dry rot.
4. Mats shall be equipped with lifting cables or exposed bolts for ease of handling.

2.2 TREE RELOCATION MATERIALS

A. Boxing Materials.

1. 2" by 12" Douglas fir for sides and bottoms.
2. 2" by 6" Douglas fir for braces.
3. 4" by 6" Douglas fir for skidding to brace top of box.
4. 1" by as needed for box size, Hemlock or Cedar for top pad.
5. No redwood or other similar soft-wooded lumber shall be used in the construction of tree boxes.

B. Moving Materials: 4" by 4" Douglas fir bottom stringers.

C. Hardware:

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1. 16-penny and 10-penny nails.
2. Black domestic steel strapping, 1-1/4" by 0.031".
3. 1/2" bolts, 18" long, threaded one end, hooked on the other.
4. Number 9 galvanized wire. Galvanized nails, sized per construction industry standard.

D. Pruning Materials: Pruning sterilant shall be Physan 20 Gertilome Type A or diluted bleach, or equal.

PART 3 - EXECUTION

3.1 PROTECTION OF TREES

A. Tree Protection Plan: The Tree Protection Plan shall be prepared by, or under the direction of, the Contractor. The Tree Protection Plan shall be approved by the Owner prior to any construction activities.

1. The Tree Protection Plan shall demonstrate protection of all parts of the trees including the roots which shall be protected from soil compaction, damage by trenching, or excessive grade changes and hazardous materials or waste products.
2. The Tree Protection Plan shall include a description of the protective measures that are required to protect the trees and shrubs, which may include but are not limited to:

    a. Protective fencing
    b. Protective mulch
    c. Protective fabric
    d. Logging mats

3. The Tree Protection Plan shall address all tree protection issues within the project construction and staging areas as stated in this Section of the Specifications.
4. The Tree Protection Plan shall address tree canopy protection within the project work area as stated in this Section of the Specifications.
5. The Tree Protection Plan shall address trenching within tree canopy areas as stated in this Section of the Specifications.
6. The Tree Protection Plan shall include a Tree Protection Map which shall:

    a. Show all affected areas of the project involving tree or landscape protection.
    b. Show the location, species, and diameter of all existing trees and landscaping that may be negatively impacted by the project.
    c. Indicate which trees and shrubs are to be removed and which ones are to remain.
    d. Include protection measures for all tree and landscape impacts, including all utility connections for the project or new facility.

B. Water: Provide ample water supply of potable quality and sufficient quantity for all operations required under this Section.

C. The existing trees to be preserved presently are in excellent condition. Trees shall not be allowed to deteriorate and shall be maintained in a healthy and vigorous condition during the course of construction and maintenance period.

D. During the course of construction, the Contractor shall take all necessary precautions, as outlined herein, to protect the existing trees to be preserved from injury or death. Protection shall be given to the roots, trunk, and foliage of all existing trees to remain.

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E. Trees, subject to the provisions of this Section of the Specifications which have been injured shall be repaired immediately by an approved, certified arborist. Repair shall include removal of rough edges and sprung bark and severely injured branches as directed by the Owner.

F. Tree protection fencing shall be installed for the protection of existing trees to be preserved. No construction, demolition, or work of any nature will be allowed within the fenced area without prior written approval by the Owner.

1. Approval by the Owner for work within the fenced area shall not release the Contractor from any of the provisions specified herein for the protection of existing trees to be preserved.
2. During the course of construction of approved work within the fenced area, no roots larger than two inches in diameter shall be cut without prior written approval by the Owner.

G. During construction, the existing site surface drainage patterns shall not be altered within the area of drip-line. Contractor shall take special precautions to maintain the original grade throughout construction for the area within the drip line.

H. Contractor shall not alter the existing water table within the area of drip-line.

I. Take necessary measures to maintain healthy living conditions for existing trees to e preserved. Such measures shall include but not be limited to periodic washing of leaves for the removal of dust, irrigation, etc.

J. The area within the drip line of any tree shall be used for the storage of construction materials only when absolutely necessary, as approved by the Owner, and only for storage of light-weight materials. When the storage of materials is necessary in the drip line areas, the Contractor shall utilize one or a combination of the tree protection measures as described in this Section of the Specifications that are used to prevent rutting, potholes, and compaction of the root zone. These areas shall not be overstocked, which might prevent sufficient watering of the trees. At no time shall more than 50% of the area within a tree's drip line be covered for storage to allow proper irrigation. The Contractor shall periodically relocate materials in storage to a different section of the area within the drip line. When storage items have been removed from the area within the drip line, the Contractor shall aerate compacted soil.

K. Do not permit the following within drip-line of any existing tree to be preserved:

1. Storage or parking of automobiles or other vehicles.
2. Skinning or bruising of bark.
3. Use of trees as support posts, power poles, or signposts; anchorage for ropes, guy wires, or power lines; or other similar functions.
4. Dumping of poisonous materials on or around trees and roots. Such material includes but is not limited to paint, petroleum products, contaminated water, or other deleterious materials.
5. Cutting of tree roots by utility trenching, foundation digging, placement of curbs and trenches, and other miscellaneous excavation without prior written approval by the Owner.
6. Damage to trunk, limbs, or foliage caused by maneuvering vehicles or stacking material or equipment too close to the tree.
7. Compaction of the root area by movement of trucks or grading machines; storage of equipment, gravel, earth fill, or construction supplies, etc.
8. Excessive water or heat from equipment, utility line construction, or burning of trash under or near shrubs or trees.

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9. Damage to root system from flooding, erosion, and excessive wetting and drying resulting from dewatering and other operations.

L. Excavation Around Trees:

1. The Contractor shall direct utility access routes away from trees. Where practical, direct water, gas and other services around the drip line of existing trees to remain. Excavation within drip lines of trees shall be done only where absolutely necessary and as approved by the Owner.
2. Where trenching for utilities is required within drip lines, trenching around roots shall be by hand digging. The Contractor shall direct the trench as far away from the trunk as practical. Main lateral roots and taproots shall not be cut. Smaller roots that interfere with installation of new work may be cut wit prior approval from the Owner.
3. Where excavation for new construction is required within drip line of trees, hand excavation shall be employed to minimize damage to root system. Roots shall be relocated in backfill areas wherever possible. If large, main lateral roots are encountered, they shall be exposed beyond excavation limits as required to bend and relocated without breaking. If encountered immediately adjacent to location or new construction and relocation is not practical, roots shall be cut approximately 6 inches back from new construction.
4. When possible, the Contractor shall use boring or tunneling methods for utilities in the area within the drip line. The Contractor shall bore or trench as deep as practical to avoid the main feeding roots, which are near the surface.
5. Exposed roots shall not be allowed to dry out before permanent backfill is placed. Temporary earth cover shall be provided, or roots shall be packed with wet peat moss or four layers of wet, untreated burlap and temporarily supported and protected from damage until permanently relocated and covered with backfill. The cover over the roots shall be wetted to the point of runoff daily.
6. Branching structure shall be thinned in accordance with NAA "Pruning Standards and Practices" to balance loss to root system. Thinning shall not exceed 30 percent of existing branching structure.

M. Tree Canopy Protection Within Project Work Area: Protective measures for any limbs that may interfere with intended work or to be impacted by construction equipment:

1. Identify areas where construction equipment (i.e. dump trucks, backhoes, etc.) may cause damage to overhanging limbs.
2. Consult with UGA Grounds Department to determine method of addressing situation that will cause least damage to tree - either pruning or tying back.
3. Should limb removal be deemed necessary, the UGA Grounds Department will provide all necessary pruning.

3.2 TREE RELOCATION

A. Pruning: Trees to be relocated which require pruning prior to boxing shall be inspected by the Owner and the Contractor before starting the work. All pruning shall be as recommended by an arborist certified by the International Society of Arboriculture, and as approved by the Owner.

1. Unnecessary pruning shall not be performed. All pruning shall be done according to accepted horticultural practices and as approved by the Owner.
2. A sample tree shall serve as a guide in the pruning of the remaining trees. The Contractor shall retain as much of the tree head (approximately two-thirds) as possible without endangering the life of the tree.

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3. All pruning cuts over 1/2-inch diameter shall be coated with pruning paint within 8 hours of pruning.

B. Preparation:

1. Contractor shall spray all trees to be moved prior to digging with "Wilt Proof", or equal (no known equal). Application shall be made according to manufacturer's printed directions.
2. All trees to be relocated shall be root drenched with Subdue, or equal (no known equal, at the rate of 3 oz/100 gallons of water.
3. The moisture content of the soil around the trees shall be controlled by the Contractor so that no soil breaks away from the ball during root trimming.

C. Boxing Construction and Procedures: All trees to be relocated shall be side boxed initially. All roots larger than 3/4-inch diameter which are severed during the side boxing shall be treated with a root antidesiccant to diminish root transpiration.

1. No machine digging shall be permitted. All trees shall be hand dug, and all root pruning shall be done by hand. Dig and box trees to the full box size. Exposed ends of all roots shall be cut clean and squared with pruning clippers or a pruning saw; then painted with pruning paint within 8 hours and with tree seal before boxing.
2. The box sides shall be secured firmly around the rootball with strapping before placing the bottom boards. The soil shall be placed against the sides of the box to contain water and to produce a well basin at the top of the rootball.
3. Box Sizes: Box sizes for individual trees to be boxed shall be no less than the size specified on the Drawings. Any deviation from such sizes shall be made with the approval of the Owner in writing in advance. All boxes to be used shall be of new, sound, Douglas fir. No used boxes will be allowed.

D. Maintenance During Boxing:

1. Soil around trees shall be dried out so that no soil breaks away from the ball during trimming, but not so dry that the tree will be damaged. Under no circumstances shall the rootball be permitted to dry out. Cut rootballs to the full size of the box. Exposed ends of all roots shall be cut clean and square, then painted with tree seal prior to boxing. 48 hours prior to cutting, an application of vitamin B-1 shall be administered to the rootball of the tree. Hose drip irrigation to saturate the rootball only shall be administered during this period. Side boxing shall begin immediately.
2. Following the side boxing operation, the trees shall remain in place for a period of 3 weeks as approved to allow for root healing.
3. Following the approved period, the trees shall be undercut and bottom boxed. Unless approval is otherwise obtained in advance, trees shall not be tipped over to lace bottom board To of boxes shall be high enough to clear top of rootballs by at least 3 inches. Soil shall be placed against sides of box to contain water. Place temporary guy wires, slings, or other devices as needed and approved to permit safe relocation of the trees. The trees shall not be stored on the site but shall be, immediately after relocation, planted in the areas indicated on the Drawing as is approved. All excavation for the planting of the relocated trees shall have been accomplished and approved prior to the relocation operations. All trees to be relocated shall be ultimately transplanted on the site.
4. Maintenance of the trees during the side boxing, storage and relocation period shall be the responsibility of the Contractor.

E. Moving Procedures:

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1. Transport trees in a manner to least disturb the tree ball and head during relocation. Prior to the commencement of the relocation, submit an equipment list for approval by the Owner. Using approved equipment, lift tree without any damage to the tree.
2. The crane cable for moving trees shall be secured around the tree box in order to lift the tree out of the ground. Under no circumstances shall the crane cable or sling be directly secured or tightened around the tree trunk or branches.
3. Banding or strapping shall run vertically on all four sides of the box. It shall be applied twice, wrapped under and over the box on each end of the four sides. Band strapping shall likewise be placed horizontally at each end of the four side panels. This procedure shall be duplicated on all boxes 84 inches and larger.

    a. Apply 2" by 4" skids of Douglas fir on the top and bottom of the box.
    b. Bottom strapping skids shall be applied to 60-inch boxes and larger varying from 2" by 4" to 2" by 12" as needed.
    c. The Contractor shall be responsible for assuring that all boxes are constructed to withstand the strains and stresses of moving and weathering. All trees in boxes that break shall be reboxed in new boxes at the Contractor's expense.
    d. All boxed trees shall be top padded with 1-inch material grade No. 3 or No. 4 to protect the tree and rootball during transport. No sheet plywood will be allowed in top padding procedure.

F. Place temporary guy wires, slings, or other such devices as needed to permit the safe moving of the trees. These devices shall remain in place until the tree is securely rooted within the box.

1. Guy materials shall be as follows:

    a. Guying wires of zinc-coated iron of 9-gauge wire unless otherwise approved.
    b. Anchors (deadmen) for holding guys - 4" by 4" solid redwood lumber, 30" long.
    c. Hose covering wire, 2-ply reinforced rubber hose, at least 1/2" diameter, at least 12" long.
    d. Flags shall consist of white polyethylene hose, 1/2" diameter, at least 12" long.

2. Guys shall be connected to strong side crotch of trunk and branches and in a way to prevent injury or damage to the tree, using hose cover over wire loops. Any guy wires which must be near tree branches where abrasion might occur shall be covered with hose the length of the potential abrasion, and as approved. Size of turnbuckle shall be adequate to withstand any stresses in the guy wires without opening or failing.

3.3 TRIMMING OF TREES

A. In company with the Owner or the Owner's Representative, and registered arborist ascertain the limbs and roots which are to be trimmed, and clearly mark them to designate the approved point of cutting.

B. A consulting arborist, registered by the American Society of Consulting Arborists (ASCA), shall be engaged to direct removal of branches from trees and large shrubs which are to remain if required to clear for new construction.

C. Dead and damaged trees that are determined by the Owner and arborist to be incapable of restoration to normal growth pattern shall be removed.

D. Cut evenly, using proper tools and skilled workmen, to achieve neat severance with the least possible damage to the tree.

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E. In the case of root cuts, apply wet burlap or other protection, approved as noted herein, to prevent drying out, and maintain in a wet condition as long as necessary for temporary protection.

3.4 IRRIGATION SYSTEM

A. Protect existing irrigation system from damage.

B. Provide irrigation system for boxed trees.

3.5 REPAIR COMPENSATION

A. Damage to existing tree crowns or roots over 1 inch in diameter shall be immediately reported to the Owner in writing, and, at the direction of the Owner repaired immediately at the Contractor's expense by an approved certified arborist.

B. A certified arborist shall direct repair of trees damaged by construction operations. Repairs shall be made promptly after damage occurs to prevent progressive deterioration of damaged trees.

C. Any tree to remain which is damaged or destroyed owing to the Contractor's negligence or failure to provide adequate protection shall be compensated for in accordance with the following schedule of values using "tree caliper" method (greatest trunk diameter, measured 18 inches above ground):

1. For trees and shrubs with diameters up to and including 6 inches, compensation shall be the actual cost of replacement with item similar in species, size, and shape, including:

    a. Actual cost of item boxed out of ground.
    b. Transportation or delivery of boxed item to site.
    c. Planting and staking.
    d. Maintenance, including watering, fertilizing, pruning, pest control, and other care to bring replacement to same general condition of original item.

2. For trunks up to:

7"	$1,500
8"	$2,000
9"	$2,500
10"	$3,000
11"	$3,500
12"	$4,000
13"	$4,500
14"	$5,000
15"	$5,500
16"	$6,000
17"	$6,500
18" and over, add for each caliper inch	$ 700

D. Damaged tree limbs or trees which have died as a result of injury during construction shall remain the property of the Owner and shall remain or be removed by the Contractor as directed by the Owner.

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3.6 MAINTENANCE

A. Contractor shall be responsible to perform periodic inspections of existing trees to be preserved and submit written proposals to the Owner for additional maintenance work as may be required to ensure the health and general well-being of the trees. Contractor shall retain, at the direction of the Owner additional specialists as may be required to perform this work.

B. Root Hormone: Apply as follows:

1. Construct tree basins at rims or outer edge of the treebox so that applied water will remain on top of the rootball.
2. Apply root hormone at the rate of 2 ounces of root hormone dissolved in a 2-gallon bucket of water, poured on top of the rootball and contained thereon by the basin rims. Immediately after root hormone application, fill the tree basin with water and allow it to settle within the soil. Repeat application, fill the tree basin with water and allow it to settle within the soil. Repeat application twice.

C. Mulching: Trees shall be mulched with 1-inch nitrolized fir bark immediately after completion of the root hormone application and its irrigation into the rootball.

D. The Contractor shall keep the tree storage site and tree boxes free from weeds and debris at all times.

E. Irrigation: During construction the existing trees to be preserved shall, at the direction of the Owner, be given deep watering (be irrigated). Quantities and lengths of time are variable and shall depend upon seasonal rainfall.

3.7 PAYMENT

A. Payment for items covered under this Section will be included in the lump sum price bid for the completed work and constitutes full compensation for furnishing all labor equipment, materials, and incidentals necessary, in accordance with the Drawings, and as may be required.

END OF SECTION 015639

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SECTION 015731 - LEED INDOOR AIR QUALITY MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Special requirements for Indoor Air Quality (IAQ) management during construction operations.

    a. Control of emissions during construction.

2. Procedures for testing baseline IAQ. Baseline IAQ requirements specify maximum indoor pollutant concentrations for acceptance of the facility.

C. Related Requirements:

1. Division 01 Section "Submittal Procedures" for required submittal procedures.
2. Division 01 Section "Temporary Utilities and Facilities" requirements for installation, maintenance and removal of temporary utilities, controls, and facilities during construction.
3. Division 01 Section “Sustainable Design Requirement – LEED V4/V4.1bd+C: New Construction.”
4. Division 01 "General Commissioning Requirements" for coordination with commissioning activities.
5. Division 01 Section “Basic Product Requirements” procedures for storage of interior materials to prevent exposure to moisture and pollutants.
6. Division 23 sections “Low Pressure Ductwork” and “High Pressure Ductwork” for duct cleaning procedures.

1.2 IAQ MANAGEMENT SUMMARY

A. The COTR has established that the contractor shall prevent indoor air quality problems resulting from the construction process, to sustain long term installer and occupant health and comfort.

B. Protect the ventilation system components during construction and clean contaminated components after construction is complete.

C. Control sources of potential IAQ pollutants by controlling selection of materials and processes used in project construction.

1.3 REFERENCES

A. Definitions: Definitions pertaining to sustainable development: As defined in ASTM E2114.

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1. Adequate Ventilation: Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of particulates, dust, fumes, vapors, or gases.
2. Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173, requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261.

    a. Hazardous materials include: pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).

3. Indoor Air Quality (IAQ): The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the relative quality of air in a building with respect to contaminants and hazards and is determined by the level of indoor air pollution and other characteristics of the air, including those that impact thermal comfort such as air temperature, relative humidity and airspeed.
4. Interior Final Finishes: Materials and products that will be exposed at interior, occupied spaces; including flooring, wallcovering, finish carpentry, ceilings, and sealants.
5. Packaged Dry Products: Materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging; including carpets, resilient flooring, ceiling tiles, and insulation.
6. Wet Products: Materials and products installed in wet form, including paints, sealants, adhesives, special coatings, and other materials which require curing.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preconstruction Conference: After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with COTR, Construction Manager, and Architect to discuss the proposed IAQ Management Plan and to develop mutual understanding relative to details of environmental protection.

1.5 ACTION SUBMITTALS

A. Indoor Air Quality (IAQ) Management Plan: Prepare and submit an IAQ Management Plan including, but not limited to, the following:

1. Procedures for control of emissions during onstruction.

    a. Identify schedule for application of interior finishes.

2. Procedures for moisture control during construction.

    a. Identify porous materials and absorptive materials.
    b. Identify schedule for inspection of stored and installed absorptive materials

3. Revise and resubmit Plan as required by Construction Manager.

    a. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations.

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B. Photographs documenting construction IAQ management measures implemented during construction such as duct protection measures and measures to protect on-site stored or installed absorptive materials from moisture.

C. Cut sheets of filtration media used during construction with MERV values highlighted.

D. Product Data:

1. Submit product data for filtration media used during construction and during operation. Include Minimum Efficiency Reporting Value (MERV).
2. Submit air pressure difference maps for each mode of operation of HVAC.
3. Material Safety Data Sheets: Submit MSDSs for inclusion in Operation and Maintenance Manual for the following products.

a. Adhesives.
b. Floor and wall patching/leveling materials.
c. Caulking and sealants.
d. Insulating materials.
e. Fireproofing and firestopping.
f. Carpet.
g. Paint.
h. Clear finish for wood surfaces.
i. Lubricants.
j. Cleaning products.

E. Inspection and Test Reports:

1. Baseline Indoor Air Quality test report.

PART 2 - PRODUCTS

2.1 GENERAL ENVIRONMENTAL ISSUES

A. Mold and Mildew: Materials that have evidence of growth of molds or mildew are not acceptable, including both stored and installed materials. Immediately remove from site and dispose of properly.

B. Moisture Stains: Materials that have evidence of moisture damage, including stains, are not acceptable, including both stored and installed materials. Immediately remove from site and dispose of properly.

2.2 AIR FILTRATION MEDIA

A. Minimum Efficiency Reporting Value (MERV) as determined by ASHRAE 52.2-2007:

1. MERV-8 for filtration media used at each return air grill, if used during construction.
2. MERV-13, for filtration media installed at the end of construction and prior to occupancy.

2.3 CLEANING PRODUCTS

A. Use low-toxic and lowest-emitting spot removers and cleaning agents for surfaces, equipment, and workers' personal use.

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B. Use HEPA-filter equipped vacuum cleaners for the final cleaning.

PART 3 - EXECUTION

3.1 IAQ MANAGEMENT - EMISSIONS CONTROL

A. During construction operations, follow the recommendations in SMACNA "IAQ Guidelines for Occupied Buildings under Construction."

B. HVAC Protection:

1. Fit all return air grilles with temporary filters with a Minimum Efficiency Reporting Value (MERV) of 8.
2. Isolate the return side of the HVAC system from the surrounding environment as much as possible (e.g., place all tiles for the ceiling plenum, repair all ducts and air handler leaks).
3. Damper off the return system in the heaviest work areas and seal the return system openings with plastic.
4. Provide temporary exhaust during construction operations
5. Upgrade the filter efficiency where major loading is expected to affect operating HVAC system.
6. Clean permanent return air ductwork per National Air Duct Cleaning Association standards upon completion of all construction and finish installation work.
7. Replace all filtration media prior to occupancy.

C. Source Control:

1. Provide low and zero VOC materials as specified.
2. Do not use products in combination with or in contact with other products that can be identified as combining to form toxic fumes or sustained odors.

D. Pathway Interruption: Isolate areas of work as necessary to prevent contamination of clean or occupied spaces. Provide pressure differentials and/or physical barriers to protect clean or occupied spaces.

1. Use 100% outside air ventilation (when outside temperatures are between 55 degrees F and 85 degrees F and humidity is between 30% and 60%) with air exhausted directly to the outside during installation of finishes and other VOC emitting materials.
2. Erect barriers between work areas or between the inside and outside of the building to prevent unwanted airflow from dirty to clean areas.

E. Housekeeping: During construction, maintain project and building products and systems to prevent contamination of building spaces.

F. Temporary Ventilation: Provide an ACH (air changes per hour) of 1.5 or more and as follows:

1. Provide minimum 48-hour pre-ventilation of packaged dry products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues. Provide a temperature range of 60 deg F minimum to 90 deg F maximum continuously during the ventilation period. Do not ventilate within limits of Work unless otherwise approved by Architect.
2. Provide adequate ventilation during and after installation of interior wet products and interior final finishes.

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3. Provide filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 as determined by ASHRAE 52.2 during construction and during COTR occupancy. Coordinate with Work of Division 23, Heating, Ventilating, and Air Conditioning (HVAC).

    a. Replace filters during construction as necessary to protect equipment and indoor air quality.

G. Scheduling: Schedule construction operations involving wet products prior to packaged dry products to the greatest extent possible.

1. Do not use solvents within interior areas that may penetrate and be retained in absorptive materials such as concrete, gypsum board, wood, cellulose products, fibrous material, and textiles.

3.2 IAQ MANAGEMENT – IMPLEMENTATION OF PLAN

A. Manager: The Contractor shall designate an on-site party (or parties) responsible for instructing workers and overseeing the IAQ Management Plan for the Project.

1. Report all issues to General Contractor for immediate correction.

B. Progress Meetings: Construction related IAQ procedures shall be included in the pre-construction and construction progress meeting agendas.

C. Distribution: The Contractor shall distribute copies of the IAQ Management Plan to the Job Site Foreman, each Subcontractor, the COTR, the Architect.

D. Instruction: The Contractor shall provide on-site instruction of the IAQ procedures and ensure that all participants in the construction process understand the importance of the goals of the IAQ Management Plan.

E. Verification: Project Manager to fill out the Construction IAQ Management Plan Inspection Checklist with photographs of the measures in place during weekly site visits.

F. On-site Check-in Procedures: General Contractor and Sub Contractor to review and agree on specified products and VOC limits before Sub Contractor begins work using the VOC Verification Checklist.

3.3 INDOOR AIR QUALITY ASSESSMENT - IAQ TESTING

A. After construction ends and before occupancy, but under ventilation conditions typical for occupancy, the General contractor will conduct Baseline IAQ testing. All interior finishes, such as millwork, doors, paint, carpet, acoustic tiles, and movable furnishings (e.g., workstations, partitions), must be installed, and major VOC punch list items must be finished.

3.4 BASELINE INDOOR AIR QUALITY TESTING

A. Use protocols consistent with the methods listed in Table 1 for all occupied spaces. Use current versions of ASTM standard methods, EPA compendium methods, or ISO methods, as indicated. Laboratories that conduct the tests for chemical analysis of formaldehyde and volatile organic compounds must be accredited under ISO/IEC 17025 for the test methods they use.

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END OF SECTION 015731

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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. 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.

C. Related Requirements:

1. Division 01 Section "Summary" for Contractor requirements related to Owner-furnished products.
2. Division 01 Section "Alternates" for products selected under an alternate.
3. Division 01 Section "Substitution Procedures" for requests for substitutions.
4. Division 01 Section "References" for applicable industry standards for products specified.
5. Division 01 Section "Closeout Procedures" for submitting warranties.

1.2 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. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless otherwise indicated.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, 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 single manufacturer's product is named and accompanied by the words "basis-of-design," 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. Basis of design products may be selected as part of a system constituting multiple products and designed to work together as part of a system to achieve a specific result.

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1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

C. Date Sensitive Compliance (Date Sensitive Compliant): Systems, equipment and component parts thereof which function in connection with or utilize computer systems and subsystems, hardware, software, firmware, including embedded chip systems and components which process, sequence, calculate or in some fashion are affected by or dependent upon date and date related or time and time related data, including the passage of time, shall properly function and continue to correctly process, sequence and utilize date and time related data for dates and times which occur during a reasonable life expectancy thereof, for all dates on and after date of Substantial Completion, including leap year calculations.

D. Offshore Fabrication: if items are fabricated outside of the United States, manufacturer must appoint or designate a local representative located not more than two hours from the project site who is authorized to make minor adjustments and changes to the product without voiding the product or assembly warranty.

1.3 ACTION SUBMITTALS

A. Comparable Product Request Submittal: 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 and the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title, and Drawing numbers and titles.
2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
3. 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 ten (10) working days of receipt of request, or seven (7) working days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
    b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Division 01 Section "Submittal Procedures."

C. Substitution: Refer to Division 01 Section "Substitution Procedures" for definition and limitations on substitutions.

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1.4 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. Resolution of Compatibility Disputes between Multiple Contractors:

a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
b. If a dispute arises between multiple contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

B. Architect's Approval: Wherever the terms "or equal", or "or approved equal", or "or approved", are used in specifying products or naming manufacturers in the various specification sections, the Architect is the sole judge of equality and acceptability of products and manufacturers submitted as equals to the specified products and manufacturers.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's product names or trademarks on exposed surfaces of products or equipment which will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible, but inconspicuous, surface in occupied spaces. The nameplate shall contain the following information and other essential operating data:

a. Name of product and manufacturer.
b. Model and serial number.
c. Capacity.
d. Speed.
e. Ratings.

3. See individual identification Sections in Divisions 21, 22, 23, 26, 27, and 28 for additional equipment identification requirements.

D. Reliability of Calculations by Date Sensitive Equipment, Systems and Components:

1. Date sensitive equipment, systems and components thereof shall individually and in combination properly function and continue to correctly process, sequence and utilize date and time related data, which occur during a reasonable life expectancy for said equipment, systems, and components thereof.
2. Correctly process, sequence, and calculate date and date related data for dates prior to, through and after date of Substantial Completion, including leap year calculations.
3. Software products that process date or date related data shall recognize, store, and transmit date data in a format which explicitly and unambiguously specifies the correct century.
4. Contractor shall include this requirement in all sub-contracts and equipment orders for this Project.
5. Submittals: Provide certification from suppliers and sub-contractors providing date sensitive equipment, systems, and software that the proposed equipment, components and systems comply with these requirements.

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1.5 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

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

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 form furnished by individual manufacturer for a particular product and issued in the name of the Owner or specifically endorsed by manufacturer to Owner.

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2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.

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

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

C. Warranty Period: Unless otherwise specified, the Warranty Period shall be one year from date of Substantial Completion.

D. Submittal Time: Comply with requirements in Division 01 Section "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.

B. Provide materials and equipment that are of good quality and new, unless otherwise specified, are free from faults and defects not inherent in the quality required, that conform with requirements of Contract Documents, that are suitable for use and function intended, that are corresponding in quality to related materials in the absence of a complete specification, that are of quality appearance where exposed to view, that are of one manufacturer or source for the same specific purpose, with uniform appearance and physical properties, and that are identical and interchangeable when required in quantity

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. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
7. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

a. Submit additional documentation required by the Architect in order to establish equivalency of proposed products.

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b. The Architect is solely responsible for evaluation of products and manufacturers submitted as “Or equal” to the specified product or manufacturer.

C. Building systems, equipment, and software shall be “Date Sensitive Compliant” as defined by this Section.

D. Product Selection Procedures:

1. Sole 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.

   a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."

2. Sole 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.

   a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

   a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."

4. Non-Limited List of Products: 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.

   a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
   b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

   a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

6. Non-Limited List of Manufacturers: 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.

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a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

7. Basis-of-Design Product: Where Specifications paragraphs or subparagraphs titled "Basis of Design" are included to 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 may additionally 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.

a. For approval of products by unnamed manufacturers, comply with requirements in Division 01 Section "Substitution Procedures" for substitutions for convenience.

E. 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 satisfactorily.

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

F. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's colors, patterns, textures" or similar phrase, select a product that complies with requirements.

1. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures, or similar phrase, the Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes not include premium items.
2. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, the Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

G. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.

1. Select products for which sustainable design documentation submittals are available from manufacturer.

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, will produce the indicated results, and is compatible with other portions of the Work.

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2. Evidence that the proposed product will not cause additional cost in adjacent materials, systems, or assemblies; that proposed product is compatible with adjacent materials, systems, and assemblies.
3. Detailed comparison of significant qualities of proposed product with those named basis of design product. Significant qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics and other specific features and requirements.
4. Evidence that proposed product provides specified warranty.
5. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
6. Samples, where applicable or requested.
7. Certificates and qualification data, where applicable or requested.
8. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Division 01 Section "Submittal Procedures."

C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

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SECTION 016116 – FLORIDA PRODUCT APPROVAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Administrative, procedural, and regulatory requirements for selection of products for use in Project and approval of products by the following:

    a. Florida Building Commission.
    b. Miami-Dade County.

C. Related Requirements:

1. Division 01 Section "Product Requirements" for administrative and procedural requirements for product, material, and equipment selection.

1.2 FLORIDA BUILDING COMMISSION PRODUCT APPROVAL REQUIREMENTS

A. Building products and systems, which comprise the building exterior envelope and structural frame, shall be approved by the Florida Building Commission for compliance with the Florida State Building Code, Seventh Edition (2020), of the Florida Building Code.

B. The Florida Building Commission web site, www.floridabuilding.org, contains requirements for submitting an application for Product Approval, and contains a database listing of state approved products and manufacturers.

C. Comply with Florida Administration Code (F.A.C.), Rule Chapter 61G20-3 "Product Approval", latest rule version. Provide one of the following for each product installed as part of building exterior envelope:

1. Florida Building Commission Product Approval Evaluation Report. A Product Approval Evaluation Report, from the Florida Building Commission Product Approval Section.
2. Product Test Report: A product test report from an approved testing laboratory, which provides documentation indicating the product tested complies with the Florida Building Code.
3. Product Evaluation Report: A product evaluation report from an approved evaluation entity, which provides documentation indicating the product evaluated complies with the Florida Building Code.

D. Products in the following categories, and their defined subcategories, as defined by F.A.C. Rule Chapter 61G20-3 "Product Approval", shall be approved by the Florida Building Commission for use in the State of Florida:

1. Panel Walls.
2. Exterior Doors.
3. Roofing Products.

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4. Skylights.
5. Windows.
6. Shutters.
7. Structural Components.
8. Impact Protective Systems.

E. Exceptions: Products which have prescriptive specification standards and are manufactured under quality assurance procedures as specified in the Florida Building Code will be deemed approved. Such products shall include, but not be limited to the following:

1. Structural components covered by the United States Department of Commerce Product Standards.
2. Structural components comprised of products that are assembled or placed in the field and are subject to standardized field testing procedures contained within national recognized standards adopted within the Florida Building Code may demonstrate compliance by a batch ticket or bill of lading made available at the site of assembly or placement.

F. Validation of product compliance with the Florida Building Code shall be performed by approved validation entities as required by F.A.C. Rule Chapter 61G20-3 "Product Approval."

G. Product Evaluation and Quality Assurance:

1. Method 1: Products specifically addressed in the Florida Building Code through performance criteria and standard test methods or standard comparative or rational analysis methods, which cannot be approved through the plan review and inspection process, shall demonstrate compliance with the Florida Building Code through one of the following:

   a. A certification mark or listing from an approved certification agency.
   b. A test report from an approved testing laboratory.
   c. An evaluation report from an approved product evaluation entity.
   d. An evaluation report from a Florida Registered Architect or a licensed Florida Professional Engineer.

2. Method 2: Products for which there are no specific standardized tests or comparative or rational analysis methods of evaluation established as required by the Florida Building Code shall demonstrate compliance with the intent of the Florida Building Code through one of the following:

   a. An evaluation report from an approved product evaluation entity.
   b. An evaluation report from a Florida Registered Architect or a licensed Florida Professional Engineer.

1.3 MIAMI-DADE COUNTY PRODUCT APPROVAL REQUIREMENTS

A. Building products and systems, which comprise the building exterior envelope and structural frame, shall be approved by one of the following methods:

1. Florida Building Commission: Approval by the Florida Building Commission for compliance with the Florida State Building Code, Seventh Edition (2020).
2. Miami-Dade County: Approval by Miami-Dade County, Building and Neighborhood Compliance Department, for compliance with the Florida State Building Code, Seventh Edition (2020).

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B. The Miami-Dade County web site, www.miamidade.gov/building/product-control.asp, contains requirements for submitting an application for Product Approval, and contains a database listing of Miami-Dade County approved products and manufacturers.

C. Comply with the Code of Miami-Dade County, Florida, Chapter 8 – Building Code, Article IV – Product Approval, Sec. 8-40 – Product Approvals. Provide one of the following for each product installed as part of building exterior envelope, as applicable:

1. Miami-Dade County Product Control Section Notice of Acceptance (NOA): A Notice of Acceptance (NOA), from the Miami-Dade County Product Control Section.
2. Miami-Dade County Product Control Section Certificate of Competency: A Certificate of Competency, from the Miami-Dade County Product Control Section.

D. Products in the following categories, and their defined subcategories, as defined by F.A.C. Rule Chapter 61G20-3 "Product Approval", shall be approved by Miami-Dade County for use in Miami-Dade County, Florida:

1. Panel Walls.
2. Exterior Doors.
3. Roofing Products.
4. Skylights.
5. Windows.
6. Shutters.
7. Structural Components.
8. Impact Protective Systems.

E. Exceptions: As directed by Lake County.

F. Validation of Product Compliance with the Florida Building Code: As directed by Lake County.

G. Product Evaluation and Quality Assurance: As directed by Lake County.

1.4 INFORMATIONAL SUBMITTALS

A. Florida Product Approval Reports: One of the following:

1. Florida Building Commission Product Approval Evaluation Report: For building exterior envelope products and systems, from the Florida Building Commission Product Approval Section.

    a. Submit one of the following for any building product or system which does not have a Florida Building Commission Product Approval Evaluation Report:

        1) Certification Mark or Listing: From an approved certification agency.
        2) Test Report: From an approved testing laboratory.
        3) Evaluation Report: From an approved product evaluation entity.
        4) Evaluation Report: From a Florida Registered Architect or a licensed Florida Professional Engineer.

2. Miami-Dade County Product Control Section Notice of Acceptance (NOA): For building exterior envelope products and systems, from the Miami-Dade County Product Control Section.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Wind Loads: Refer to Structural Drawings for component and cladding pressure diagrams, determined by a project specific cladding wind load study.

1. Ultimate Design Wind Speed: 143 mph (3-Second Gust).
2. Risk Category: Category III.
3. Site Exposure Category: Exposure C.

B. Florida Product Approval Listing: One of the following:

1. Florida Building Commission Product Approval Listing: Building exterior envelope products, systems, and component materials shall comply with requirements in the Florida Building Code, Seventh Edition (2020), including the High Velocity Hurricane Zone (HVHZ) of the Florida Building Code, as part of a building system, and shall be listed in the Florida Building Commission's Product Approval Listing for building systems identical for that specified for this Project.
2. Miami-Dade County Product Control Section Notice of Acceptance (NOA) Listing: Building exterior envelope products, systems, and component materials shall comply with requirements in the Florida Building Code, Seventh Edition (2020), including the High Velocity Hurricane Zone (HVHZ) of the Florida Building Code, as part of a building system, and shall be listed in the Miami-Dade County Product Control Section Notice of Acceptance (NOA) Listing for building systems identical for that specified for this Project.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016116

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SECTION 017300 – EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. General administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

a. Construction layout.
b. Installation of the Work.
c. Cutting and patching.
d. Coordination of Owner's portion of the Work.
e. Coordination of Owner-installed products.
f. Progress cleaning.
g. Starting and adjusting.
h. Protection of installed construction.
i. Correction of the Work.

C. Related Requirements:

1. Division 01 Section "Summary" for coordination of Owner-furnished products, and limits on use of Project site.
2. Division 01 Section "Quality Requirements" for qualification requirements.

1.2 DEFINITIONS

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

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 PREINSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site.

1. Attendees:

a. Contractor's superintendent.
b. Trade supervisor responsible for cutting operations.
c. Trade supervisor(s) responsible for patching of each type of substrate.
d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
e. Inform Architect of scheduled meeting.
f. Require representatives of each entity directly concerned with cutting and patching to attend.

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2. Agenda: Prior to commencing work requiring cutting and patching,

    a. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor or professional engineer.

B. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

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.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

A. Professional Engineer Qualifications: Refer to Division 01 Section "Quality Requirements." 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.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection. Structural elements include the following:

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a. Foundation construction.
b. Bearing and retaining walls.
c. Structural concrete.
d. Structural steel.
e. Lintels.
f. Stair systems.
g. Miscellaneous structural metals.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

a. Primary operational systems and equipment.
b. Fire separation assemblies.
c. Air or smoke barriers.
d. Fire-suppression systems.
e. Plumbing piping systems.
f. Mechanical systems piping and ducts.
g. Control systems.
h. Communication systems.
i. Fire-detection and -alarm systems.
j. Conveying systems.
k. Electrical wiring systems.
l. Operating systems of special construction.
m. Electronic security systems.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Exterior curtain-wall construction.
d. Sprayed fire-resistive material.
e. Equipment supports.
f. Piping, ductwork, vessels, and equipment.
g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner. Visual elements include the following:

a. Processed concrete finishes.
b. Stone cladding.
c. Ornamental metal.
d. Matched-veneer woodwork.
e. Preformed metal panels.
f. Roofing.
g. Firestopping.
h. Window system.

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i. Carpeting.
j. Fluid-applied flooring.
k. Wall covering.
l. HVAC enclosures, cabinets, or covers.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. 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 EXAMINATION

A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

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

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1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. In-Place Utilities and Mechanical/Electrical System Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect and Owner's Project Manager, in writing, not less than (72) hours in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's Project Manager's written permission.

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

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

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor,, submit a request for information to Architect in accordance with requirements in Division 01 Section "Project Management and Coordination." Include a detailed description of problem encountered, together with recommendations for changes to the Contract Documents.

3.3 CONSTRUCTION LAYOUT

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

3.4 INSTALLATION

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

1. Make vertical work plumb, and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.

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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 satisfactory results as judged by Architect. 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 of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

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

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

J. Repair or remove and replace damaged, defective, or nonconforming Work.

1. Comply with Division 01 Section "Closeout Procedures" for repairing or removing and replacing defective Work.

3.5 CUTTING AND PATCHING

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.

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

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

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Division 01 Section "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. 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.
5. Proceed with patching after construction operations requiring cutting are complete.

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

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will 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.

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a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. 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 weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 COORDINATION OF OWNER'S PORTION OF THE WORK

A. Site Access: Provide access to Project site for Owner's construction personnel and Owner's separate contractors.

1. Provide temporary facilities required for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products.
2. Refer to Division 01 Section "Summary" for other requirements for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

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B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site is not permitted. Washing waste materials down sewers or into waterways is not permitted. Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

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 ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Pollution and air contamination.
7. Water or ice.
8. Chemicals and solvents.
9. Light.
10. Radiation.
11. Puncture.
12. Abrasion.
13. Soiling, staining, and corrosion.
14. Bacteria.
15. Rodent and insect infestation.
16. Combustion.
17. Electrical current.

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18. High-speed operation.
19. Improper lubrication.
20. Unusual wear or other misuse.
21. Contact between incompatible materials.
22. Destructive testing.
23. Misalignment.
24. Excessive weathering.
25. Unprotected storage.
26. Improper shipping or handling.
27. Theft or vandalism.

3.8 STARTING AND ADJUSTING

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

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

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 PROTECTION AND REPAIR OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

D. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

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

B. Restore damaged substrates and finishes of 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.

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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.

END OF SECTION 017300

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SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

Content Requests:

<Double click here to submit questions, comments, or suggested edits to this Section.>

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. This section includes, but is not limited to administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

C. Related Requirements:

1. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.
2. Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.2 DEFINITIONS

A. Alternative Daily Cover (ADC): Material other than earthen material placed on the surface of the active face of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing, litter, and scavenging. Generally, these materials must be processed so they do not allow gaps in the exposed landfill face.

B. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

C. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

D. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

E. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

F. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

G. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

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H. Commingled Waste: Building waste streams that are combined on the project site and hauled away for sorting into recyclable streams. Also known as single-stream recycling.

I. Source Separated: Construction or demolition waste materials that are sorted into separate bins on the project site (aka on-site). This waste strategy often isolates waste materials targeted for reuse, donation, or recycling programs. Typically, sorted materials on-site include metals, wood, ceiling tiles, furniture, and concrete.

1.3 ACTION SUBMITTALS

A. Waste Management Plan: Contractor's LEED Compliance Officer/Construction Sustainability Manager shall be responsible for the development and implementation of a Construction Waste Management Plan for the Project. Submit plan to collect, sort, deposit waste and recyclable materials in accordance with the approved plan within 7 working days of date established for the Notice of Award.

1.4 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following information for each individual waste stream:

1. Material category.
2. Generation points of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
    a. Recycled waste quantity must exclude any waste used for alternative daily cover (ADC). ADC counts as landfill waste.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
8. Include legible copies of on-site logs, weight tickets and receipts with the Waste Reduction Progress Reports. Receipts shall be from recycling and/or disposal site operators who can legally accept the materials for the purpose of reuse, recycling, or disposal. The waste contractors shall have the original documents (as above) for the life of the project plus three (3) years.
9. Include verification from waste facility that ADC has been excluded from quantities of recycled waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, waste diversion and disposal as a percentage of total waste generated by the Work, to demonstrate compliance with required overall Diversion rate percentage set forth in this Section.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

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E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. LEED Submittal: Submit documentation (including Construction Waste Management and Disposal plan, waste calculations, and completed LEED Online credit form) to USGBC, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met. Respond to questions and requests from USGBC regarding construction waste management and disposal until the USGBC has made its determination on the Project's LEED certification application. Document correspondence with USGBC as informational submittals.

H. Qualification Data: For LEED Compliance Officer/Waste Management Coordinator and Refrigerant Recovery Technician.

I. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

J. Refrigerant Recovery: Comply with requirements in Division 02 Section "Structure Demolition" for refrigerant recovery submittals.

1.5 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements**.**

1. Firm employs a LEED-Accredited Professional, certified by the USGBC, as waste management coordinator.
2. Waste management coordinator may also serve as LEED Compliance Officer.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference(s): Conduct conference(s) at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of LEED Compliance Officer/Waste Management Coordinator as it pertains to waste management. The Waste Management Plan will be shared with subcontractors and requirements for handling plans will be discussed.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

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1.6 WASTE MANAGEMENT PLAN

A. General: Develop a Construction Waste Management Plan (CWMP) according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, cost/revenue analysis, and narrative complying with LEED requirements. Distinguish between demolition and construction waste. Indicate quantities by weight or volume but use same units of measure throughout waste management plan to meet the performance requirements specified in this Section. The plan must account for all materials, including land-clearing, debris, materials to be used for ADC, safe removal and disposal of hazardous materials, and other materials not contributing to diversion that are excluded from the diverted waste total.

B. Waste Identification: Indicate anticipated types and quantities of demolition and site-clearing waste generated by the Work. Use Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.

1. Establish waste diversion goals for the project by identifying at least five materials (both structural and nonstructural) targeted for diversion. Approximate a percentage of the overall project waste that these materials represent. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures. Include on-site diversion strategies. If on-site diversion strategies are not available, explain why. Describe where the material will be taken and how the recycling facility will process the material. Include whether the materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from Project site to be sorted off-site.

1. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
2. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
4. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.

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9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS

2.1 RECYCLING RECEIVERS AND PROCESSORS

A. Subject to compliance with requirements, available recycling receivers and processors include, but are not limited to, the following:

1. <Insert names and telephone numbers of local recycling receivers and processors of recyclable materials>.

2.2 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of percentage shown below; by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials to achieve the following diversion and/or waste reduction rates:

1. At least 50 percent, by volume or weight, of construction and demolition waste produced by the project diverted from landfill, that comply with LEED requirements for Construction and Demolition Waste Management v4.1 Option 1.
2. Track total waste generation or possible compliance with v4.1 Option 2 criteria for generating less than 10 lbs of construction waste per ft2 of LEED project area and divert 50%, minimum, of demolition waste.

B. Comply with the local municipal construction and demolition waste tracking requirements.

C. General: Achieve end-of-Project rates for salvage/recycling of at least 50 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition and Construction Waste (as applicable):

a. Civil and Structure Construction Demolition Waste:

1) Asphalt paving.
2) Concrete.
3) Concrete reinforcing steel.
4) Structural and miscellaneous steel.

b. Exterior and Interior Demolition Waste:

1) Brick.
2) Concrete masonry units.
3) Wood studs.
4) Wood joists.
5) Plywood and oriented strand board.
6) Wood paneling.
7) Wood trim.

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8) Rough hardware.
9) Roofing.
10) Insulation.
11) Doors and frames.
12) Door hardware.
13) Windows.
14) Glazing.
15) Metal studs.
16) Gypsum board.
17) Acoustical tile and panels.
18) Carpet.
19) Carpet pad.
20) Demountable partitions.
21) Equipment.
22) Cabinets.

c. Mechanical Demolition Waste :

1) Plumbing fixtures.
2) Piping.
3) Supports and hangers.
4) Valves.
5) Sprinklers.
6) Mechanical equipment.
7) Refrigerants.

d. Electrical Demolition Waste:

1) Electrical conduit.
2) Copper wiring.
3) Lighting fixtures.
4) Lamps.
5) Ballasts.
6) Electrical devices.
7) Switchgear and panelboards.
8) Transformers.

2. Construction Waste:

a. Masonry and CMU.
b. Lumber.
c. Wood sheet materials.
d. Wood trim.
e. Metals.
f. Roofing.
g. Insulation.
h. Carpet and pad.
i. Gypsum board.
j. Piping.
k. Electrical conduit.
l. Packaging: Regardless of salvage/recycle goal indicated in “General” Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.

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3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Wood pallets.
8) Plastic pails.

m. Construction Office Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials.

1) Paper
2) Aluminum cans
3) Glass containers

D. All fluorescent lamps, HID lamps and mercury-containing thermostats removed from the site shall be recycled.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Division 01 Section "Temporary Facilities and Controls."

B. LEED Compliance Officer/Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to Owner, LEED Consultant, and everyone concerned within three working days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

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3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Web Resources (Information only; no warranty or endorsement is implied.)

1. www.usgbc.org Site of the United States Green Building Council, with a description of the LEED certification process and requirements for C&D waste recycling
2. http://www.epa.gov/epaoswer/non-hw/debris-new Site of the U.S. Environmental Protection Agency that discusses construction and demolition waste issues, and links to other resources.

C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to the Owner, unless otherwise indicated in the Contract for Construction.

1. Contract shall provide a monthly tabulation of accrued and realized values which are derived as recycling incentives for the Owner's information, review and comment.

D. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

E. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.3 RECYCLING CONSTRUCTION AND DEMOLITION WASTE

A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch size.

1. Crush asphaltic concrete paving and screen to comply with requirements for Class 2 aggregate base specifications. in the Geotechnical Engineer's report as recommended for use as general fill and aggregate base.
2. Stockpile material for reuse in the subsequent phases of construction. Coordinate stockpile locations and sizes with the Construction Manager and the Owner.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

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1. Crush concrete and screen to comply with requirements for Class 2 aggregate base specifications. in the Geotechnical Engineer's report as recommended for use as general fill and aggregate base.
2. Stockpile material for reuse in the subsequent phases of construction. Coordinate stockpile locations and sizes with the Construction Manager and the Owner prior to processing and placement.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to meet Class 2 aggregate base specifications.

    a. Crush masonry and screen to comply with requirements for Class 2 aggregate base specifications. in the Geotechnical Engineer's report as recommended for use as general fill and aggregate base.

2. Stockpile material for reuse in the subsequent phases of construction. Coordinate stockpile locations and sizes with the Construction Manager and the Owner prior to processing and placement.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

E. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

G. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

I. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.

J. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

K. Carpet Tile: Remove debris, trash, and adhesive.

1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

L. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

M. Conduit: Reduce conduit to straight lengths and store by type and size.

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N. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.4 RECYCLING CONSTRUCTION WASTE, OTHER

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

D. Paint: Seal containers and store by type.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

3.6 ATTACHMENTS

A. Form CWM-1 for construction waste identification.

B. Form CWM-2 for demolition waste identification.

C. Form CWM-3 for construction waste reduction work plan.

D. Form CWM-4 for demolition waste reduction work plan.

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E. Form CWM-5 for construction waste

F. Form CWM-6 for demolition waste.

G. Form CWM-7 cost/revenue analysis of construction waste reduction work plan.

H. Form CWM-8 cost/revenue analysis of demolition waste reduction work plan.

END OF SECTION 017419

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SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Administrative and procedural requirements for contract closeout, including:

a. Substantial Completion procedures.
b. Final Completion procedures.
c. Inspection procedures.
d. Starting and adjusting
e. Warranties.
f. Final cleaning.
g. Repair of the Work.

C. Related Requirements:

1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
2. Division 01 Section "Photographic Documentation" for submitting final completion construction photographic documentation.
3. Division 01 Section "Submittal Procedures" for administrative submittal requirements and electronic submittal requirements.
4. Division 01 Section "Execution" for progress cleaning of Project site.
5. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
6. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
7. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
8. Divisions 02 through 33 sections for specific closeout and special cleaning requirements for products of those Sections.

1.2 DEFINITIONS

A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

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

C. Certified List of Incomplete Items (Punch List): Final submittal at Final Completion.

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1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: Certificate of Occupancy From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage. Owner will assume coverage after Substantial Completion. Contractor will identify to the Owner when Construction Insurance coverage is terminating.

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 ten (10) working 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. 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.
3. Closeout Submittals: Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, Operation and Maintenance Manuals, final completion construction photographic documentation, damage and settlement property surveys and similar final record information.
4. Technical Section Closeout Submittals: Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
    b. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

5. Submit test/adjust/balance records.
6. Sustainable Design Submittals: Submit sustainable design submittals required in Division 01 Section "Sustainable Design Requirements" and in individual sections, that were not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 working days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

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1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
6. Advise Owner of changeover in utility services.
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. Use only green cleaning products for final cleaning procedures to reduce negative impacts to indoor air quality.
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 ten (10) working days prior to date the work will be completed and ready for inspection. On receipt of request, the 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 Punch List items, either on Contractor's list or additional items identified by Architect, which must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Upon acknowledgement that the Work is substantially complete, the Architect will:

    a. Prepare a Certificate of Substantial Completion on AIA Form G704, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the Architect.
    b. Submit the Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate, including time limits for completion and correction of Work.

        1) Failure to include any item in the Punch List does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

3. The Architect and Owner may review and amend the list of items to be completed or corrected and append the Punch List of the Certificate of Substantial Completion at any time before Contractor's final Notice of Completion.
4. 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 Division 01 Section "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (Punch List), endorsed

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and dated by Architect. Final certified copy of the Punch List shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit required Project Record Drawings; Affidavit of Payment of Debts and Claims.; Affidavit of Release of Liens; Consent of Surety to Final Payment, and Consent of Surety to Reduction in or Partial Release of Retainage.
4. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
5. Submit pest-control final inspection report.
6. Submit Final Completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of ten (10) working 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. The Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. To assist the Architect in providing the punch list required by the Agreement, prepare a list of incomplete items.

B. Organization of Punch 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. Use CSI Form 14.1A.

1. Organize list of spaces in sequential order, starting with lowest floor first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. 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. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).

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.

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B. Partial Occupancy: Submit properly executed warranties within 15 working 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.

D. Designate specific warranties that will be included in operation and maintenance manuals

E. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit by uploading to web-based project software site.

F. Warranties in Paper Form:

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 (215-by-280-mm)** 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.

G. 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: Prior to Substantial Completion inspection and the Owner's occupancy of the Work, clean all areas of the building and Project Site. Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

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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,of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Remove tools, construction equipment, machinery, and surplus material from Project site.
d. 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.
e. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
f. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.

1) Sweep concrete floors broom clean in unoccupied spaces.
2) Clean ceramic tile walls and floors.
3) Clean, buff and wax resilient floors.

g. Vacuum and mop concrete.
h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
j. Remove labels that are not permanent.
k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Replace parts subject to unusual operating conditions.
n. Clean plumbing fixtures, accessories, and trim to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
p. 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 ACR.. Provide written report on completion of cleaning.

q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

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r. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
s. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Division 01 Section "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "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. Prior to performing any repairs, submit a description of repair work and procedures for approval.

B. Repair or remove and replace defective construction at no additional cost to the Owner. 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. Immediately prior to Owner occupancy, replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Immediately prior to Owner occupancy, 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

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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

a. Operation and maintenance documentation directory.
b. Emergency manuals.
c. Systems and equipment operation manuals.
d. Systems and equipment maintenance manuals
e. Product maintenance manuals.

C. Related Requirements:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
3. Divisions 02 through 33 sections for specific operation and maintenance manual requirements for products in those Sections.

1.2 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.

1.3 CLOSEOUT SUBMITTALS

A. Manual Content: Submit operations and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of 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. Submit by uploading to web-based project software site. Enable reviewer comments on draft submittals.

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2. 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.

C. Initial Manual Submittal: Submit electronic draft copy of each manual at least 30 working 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 working days before commencing demonstration and training. /Engineer and Commissioning Authority will return copy with comments.

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

E. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.4 COORDINATION

A. Where operation and maintenance documentation include information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

B. Purge manuals prior to submitting to Architect to include only technical data related to in-place construction.

PART 2 - PRODUCTS

2.1 FORMAT OF OPERATION, AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

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2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.3 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operations and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:

1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

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2.4 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

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

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

2.5 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

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. 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.

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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.

C. 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.

D. 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.

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

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

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

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.

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

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

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; 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.

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

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.

E. 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.

F. 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.

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

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

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I. 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.

J. 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 maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

K. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

2.7 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. 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. 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.

D. 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.

E. 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.
6. Schedule of finishes and commodities:

    a. Masonry materials, including decorative block, brick, and stone.
    b. Finishes for exposed woodwork.
    c. Plastic laminate.

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d. Finish door and cabinet hardware.
e. Glass and glazing.
f. Flooring materials including, stone and ceramic tile, terrazzo, wood flooring, resilient flooring and base, and carpeting.
g. Acoustical ceilings.
h. Acoustical wall treatments.
i. Special coatings, paints, and wall coverings.
j. Toilet accessories.

7. Schedule of specialties and equipment:

a. Signage and visual display surfaces
b. Toilet and bath compartments.
c. Postal specialties.
d. Fire extinguishers and cabinets.
e. Metal and wood lockers.
f. Fixed auditorium seating.
g. Window treatments including blinds, shades and draperies.

F. 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.

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

H. 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 (Not Used)

END OF SECTION 017823

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SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Administrative and procedural requirements for Project Record Documents, including the following:

    a. As Constructed Record Drawings.
    b. As Constructed Record Specifications.
    c. As Constructed Record Product Data.
    d. Record Samples.
    e. As Constructed Miscellaneous Record Submittals.

C. Related Requirements:

1. Division 01 Section "Submittal Procedures" for electronic submittal requirements, product data record submittals and final shop drawings.
2. Division 01 Section "Execution" for final property survey.
3. Division 01 Section "Closeout Procedures" for general closeout procedures.
4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
5. Sections 02 through 33 sections for specific requirements for project record documents of the Work in those Sections.

1.2 DEFINITIONS

A. Record Documents: Documents that reflect a record of the project. As-Designed Record Documents and As-Constructed Record Documents are two types of Project Record Documents.

B. As-Designed Record Documents: Final Conformed Record Drawings and Specifications Documents that reflect the record of documents created by the Architect that convey design intent for the project as known by the Designers of Record at Substantial Completion. These include original Contract Documents, and may include revisions made in response to Bulletins, Architect's Supplemental Instructions (ASIs), Construction Change Directives (CCD) as issued by the Architect.

C. As-Constructed Record Documents: Final Conformed Record Documents are provided by the Contractor and reflect the record of the building project as constructed based on information the Contractor provides to the Owner under the Contract for Construction. As-Constructed Record Drawings are mark-ups of As-Designed Record Documents that reflect as-built conditions provided by the Contractor and their subcontractors. (Commonly referred to as "As-Builts).

1.3 CLOSEOUT SUBMITTALS

A. Record Documents: Include the following delivered to Owner:

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1. Design Professional's As-Designed Final Conformed Record Documents in PDF and AutoCAD format. These may include changes made by the A/E in Bulletins and ASI's that modified the Contract Documents during contract administration.
2. The Contractor's As-Constructed Final Conformed Record Documents, which set shall reflect all changes caused by field changes or observed changes by the Contractor or subcontractor(s) during construction. Set shall be provided in PDF or AutoCAD format.

B. As-Constructed Final Conformed Record Drawings, Final and Marked-up Shop Drawings and Newly Prepared Drawings:

1. Submit to the Owner marked-up copies of Contract Drawings, and newly prepared drawings on Work that was documented only schematically. Comply with the following:

    a. Submit PDF files of marked up drawings to the Owner. Include all documents, whether changes were made or not.
    b. Submit marked up AutoCAD Digital Data Files of marked-up drawings to the owner. Include all documents whether changes were made or not.
    c. Architect may indicate whether quality of drafting provides clarity of information.

C. As-Constructed Record Specifications: Submit to the Owner list of manufacturers and products by specifications section, or annotated PDF files of Project's Specifications, including addenda and Contract modifications.

D. As-Constructed Record Product Data: Submit to the Owner, annotated PDF files via Zip format with a folder structure broken down by section. Final approved Product Data created during submittals shall serve as Record Product Data.

E. Miscellaneous As-Constructed Record Submittals: Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit to the Owner, annotated PDF files with directories of submittals including, but not limited to, the following:

1. Complete set of RFIs and RFI Responses.
2. Change Orders delivered directly to the Owner.
3. Final Samples delivered to the Owner.
4. Field records for variable and concealed conditions delivered to the Owner.
5. Project photographs delivered to the Owner.
6. Copies of final shop drawings, accepted substitutions, warranties and other forms delivered to the Owner.
7. Specific record copy requirements that expand requirements of this Section are included in the individual Sections of Divisions 02 through 33.

F. Reports: Submit written reports of Project Record Document creation, indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

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PART 2 - PRODUCTS

2.1 ELECTRONIC DATA

A. Electronic Data: Electronic digital data files of the Contract Drawings and Specifications will not be provided by Architect for Contractor's use in preparing project record documents without a properly executed “Electronic Data Transfer Agreement” included at the end of this Section.

2.2 AS CONSTRUCTED RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up PDF’s of the Contract Drawings and Shop Drawings, incorporating new and revised drawings, field modification and deviations that have been accepted by the Architect.

1. Preparation: Mark record PDF’s to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record PDFs.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an acceptable drawing technique.
    c. Record data as soon as possible after obtaining it.
    d. Record and check the markup before enclosing concealed installations.
    e. Cross-reference record prints to corresponding photographic documentation.

2. Content: All changes and field deviations from the “As-Designed Record Drawings” shall be documented on “As-Constructed Record Documents”. Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings, if not depicted on final shop drawings. Note shop drawings that indicate actual construction.
    c. Revisions to routing of piping and conduits.
    d. Revisions to electrical circuitry.
    e. Actual equipment locations.
    f. Duct size and routing.
    g. Locations of concealed internal utilities.
    h. Changes made by Change Order or Construction Change Directive.
    i. Changes made following Architect's written orders.
    j. Details not on the original Contract Drawings.
    k. Field records for variable and concealed conditions.
    l. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record PDFs.
4. Mark record PDFs with red lines. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

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B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Digital Data Files with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Annotated DWG electronic file.
2. Incorporate changes and additional information previously marked on record drawings. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.

    a. Subject to completion of the “Electronic Data Transfer Agreement” (included at the end of this Section), Architect will provide electronic data to Contractor for use in preparation of Record Document submittals.
    b. See Division 01 Section "Project Management and Coordination" for requirements related to use of Architect's digital data files.
    c. Architect will provide data file layer information. Record markups (in separate layers.

C. Newly Prepared Drawings: Prepare new Drawings where Contract Drawings are diagrammatic and neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared As-Built Drawings into As-Built Drawing sets. Comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each marked up Record Drawing; include the designation "AS-CONSTRUCTED PROJECT RECORD DRAWING" in a prominent location.

1. Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
2. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "AS-CONSTRUCTED PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

2.3 AS-CONSTRUCTED RECORD SPECIFICATIONS

A. Preparation: Submit to the Owner either a list of manufacturers and products incorporated in the final work organized by Specification Section, or mark-up a PDF of Specifications to indicate the actual products installed.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Identify items installed with the proprietary name and model number of products, materials, and equipment furnished, including approved substitutions and product options selected.

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3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

B. Format: Submit record specifications as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.4 AS-CONSTRUCTED RECORD PRODUCT DATA

A. General: Maintain one copy of each final approved Product Data submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.

1. An archive download of final product data from project CA Database will serve As-Constructed Record Product Data.

B. Preparation: Mark Product Data submittals to indicate the actual products installed.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

C. Format: Submit a compilation of As-Constructed Record Product Data as annotated PDF electronic file(s) of marked-up paper copies of Product Data.

1. Include a directory for As-Constructed Record Product Data, organized by Specification Section number and title, electronically linked to each item of Record Product Data.

2.5 RECORD SAMPLES

A. Immediately before date of Substantial Completion, meet with Architect and Owner's personnel at Project site to determine which Samples maintained during the construction period shall be transmitted to Owner for record purposes.

B. Package materials provide identification marking, and delivery to Owner's Sample storage space.

1. Dispose of other Samples in the manner specified for disposing of surplus and waste materials.

2.6 AS CONSTRUCTED MISCELLANEOUS RECORD SUBMITTALS

A. Assemble As-Constructed Miscellaneous Records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit As-Constructed Miscellaneous Record submittals to the Owner as PDF electronic file or scanned PDF electronic file(s) of marked-up miscellaneous record submittals.

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1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each final approved submittal during the construction period for project record document purposes. Post changes and revisions to project As-Constructed Documents as they occur. Do not wait until end of Project to create record documents.

B. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839

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SECTION 017900 – DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Administrative and procedural requirements for instructing Owner's personnel, including the following:

a. Demonstration of operation of systems, subsystems, and equipment.
b. Instruction in operation and maintenance of systems, subsystems, and equipment.
c. Demonstration and training video recordings.

C. Related Requirements:

1. Divisions 02 through 33 sections for specific requirements for demonstration and training in those Sections.

1.2 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, and 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.

1.3 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven 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.

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d. Name of Construction Manager.
e. Name of Contractor.
f. Date of video recording.

2. 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.
3. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

1.4 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. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "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.

1.5 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 have been reviewed and approved by Architect.

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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.

1. Motorized doors, including overhead coiling doors, overhead coiling grilles, and automatic entrance doors.
2. Equipment, including loading dock equipment, waste compactors, food-service equipment, residential appliances, and laboratory fume hoods.
3. Fire-protection systems, including fire alarm and annunciation, fire pumps, and fire-extinguishing systems.
4. Intrusion detection systems.
5. Conveying systems, including elevators.
6. Medical equipment, including medical gas equipment and piping.
7. Laboratory equipment, including laboratory air, and vacuum equipment and piping.
8. Heat generation, including boilers, feedwater equipment, pumps, and water distribution piping.
9. Refrigeration systems, including chillers, cooling towers, condensers, pumps, and distribution piping.
10. HVAC systems, including air-handling equipment, air distribution systems, and terminal equipment and devices.
11. HVAC instrumentation and controls.
12. Electrical service and distribution, including transformers, switchboards panelboards, uninterruptible power supplies, and motor controls.
13. Packaged engine generators, including transfer switches.
14. Lighting equipment and controls.
15. Communication systems, including intercommunication, surveillance, clocks and programming voice and data and television equipment.

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 fabrication engineering and 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. Operation manuals.
    c. Maintenance manuals.

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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:

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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. 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 with at least seven 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 a written performance-based test.

F. Cleanup: Collect used and leftover educational materials and 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.

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B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode, with vibration reduction technology.

1. Submit video recordings on CD-ROM or thumb drive, or by uploading to web-based Project software site.
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 on 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 recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:

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

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SECTION 018113 - SUSTAINABLE DESIGN REQUIREMENTS - LEED V4/V4.1 BD+C: NEW CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes general requirements and procedures for compliance with USGBC's LEED prerequisites and credits needed for Project to obtain LEED **Certified** certification based on USGBC's "LEED v4 for Building Design and Construction" (hereafter, LEED v4 BD + C), with select alternative compliance paths adopted from LEED v4.1.

1. Specific requirements for LEED are also included in other Sections.
2. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
3. A copy of LEED Project checklist is attached at end of this Section for information only.

    a. Some LEED prerequisites and credits needed to obtain indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.

1.2 DEFINITIONS

A. ANSI/BIFMA e3 Furniture Sustainability Standard: Standard addressing environmental and social impacts throughout the furniture supply chain.

B. Bio-Based Materials: Products containing some percentage of biologically renewable resource.

C. CDPH Standard Method v1.2: California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v1.2-2017, for the emissions testing and requirements of products and materials.

D. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001. Certificates to include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

E. Cradle to Cradle: Product certification assessing material health, material reutilization, renewable energy and carbon management, water stewardship, and social fairness.

F. Declare: A product transparency disclosure that identifies material source, composition, and end-of-life procedures.

G. Environmental Product Declaration (EPD): A transparency reporting tool communicating what a product is made of and the environmental impact.

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H. Extended Producer Responsibility: A waste management strategy promoting integration of life-cycle costs associated with goods into the market price of products. Typically, this involves a take-back or recycling program run by manufacturer at the end of the product's lifespan.

I. Facts: Standard evaluating sustainability of furniture products over the product life cycle.

J. Forest Stewardship Council (FSC) Certified Content: Permanently installed wood content that has been harvested in accordance with, and from forests certified by an FSC-accredited certification body under FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Recycled wood fiber that qualifies as contributing to Sourcing of Raw Materials is excluded from FSC Certified Content.

K. Health Product Declaration (HPD): Disclosure of products contents and associated health information.

L. LEED: USGBC's "LEED v4 (and v4.1) for Interior Design and Construction." Definitions that are part of this document apply to this Section.

M. Living Product Challenge: A product framework for manufacturers examining place, water, energy, health, materials, and equity in production of materials.

N. Manufacturer Inventory: A published, complete content inventory for products.

O. Material Cost: The dollar value of materials being provided to the site, after Contractor mark-ups, including transportation costs, taxes, fees, and shop labor, but excluding field equipment and field labor costs.

P. Non-emitting Materials: Naturally occurring materials and products that are made from inorganic materials are considered by LEED to be inherently non-emitting materials for the purposes of the Low-Emitting Materials credits because they emit either very low or no VOCs. These products do not require VOC emissions testing or certification. Inherently non-emitting materials that are excepted from low-emitting material documentation must have no integral organic-based surface coatings, binders, or sealants. Product Lens: Transparency disclosure highlighting hazard information.

Q. Product Lens: Transparency disclosure highlighting hazard information.

R. REACH Optimization: International standard outlining hazardous substances of high concern to be avoided in material composition.

S. Recycled Content: The recycled content value of a material assembly to be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Postconsumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Preconsumer" material is defined as material diverted from the waste stream during the manufacturing process. Reutilization of materials (such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it) is excluded.

T. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site. If only a fraction of a product or material is

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extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) contributes to the regional value.

U. Volatile Organic Compounds (VOC) Emissions Test: A carbon compound that vaporizes at normal room temperatures. VOC's contribute to air pollution directly and through atmospheric photochemical reactions (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate) to produce secondary air pollutants, principally ozone and peroxyacetyl nitrate.

V. WaterSense Label: The WaterSense label from the EPA specifies water efficiency and performance.

W. Urea-formaldehyde: A combination of urea and formaldehyde used in some glues and adhesives, particularly in composite wood products. At room temperature, urea-formaldehyde emits formaldehyde, a toxic and possibly carcinogenic gas."

X. Solar Reflectance Index (SRI): The measure of a constructed surface's ability to stay cool in the sun by reflecting solar radiation and emitting thermal radiation. SRI values range from zero (solid black surface) to 100 (solid white surface). SRI value of a material is calculated according to ASTM E1980 and based on the aged tested values of solar reflectance and thermal emittance.

Y. Vertical Illuminance: Illuminance levels calculated at a point on a vertical service or plane.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference virtually or at Project site. Review sustainability goals, municipal and state sustainability requirements, LEED objectives, and action plans for meeting requirements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Contractor shall upload documentation directly to LEED Online for submission to USGBC and respond to questions and requests from USGBC about its LEED prerequisites and credits that are Contractor's responsibility, that depend on product selection or product qualities, or that depend on Contractor's procedures until USGBC has made its determination on Project's LEED certification application.

1. Document correspondence with USGBC as informational submittals.

1.5 ACTION SUBMITTALS

A. General: Submit sustainable design submittals required by other Sections.

B. Sustainable design submittals shall be combined with, or submitted and reviewed concurrently with, related submittals required by other Sections for the same products.

C. Documentation complying with Division 01 Sections "General Commissioning Requirements," Division 21 Section "Commissioning of Fire Suppression," Division 22 Section "Commissioning of Plumbing," Division 23 Section "Commissioning of HVAC," and Division 26 Section "Commissioning of Electrical Systems."

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1. Documentation for luminaires indicating BUG ratings, lumens emitted, and vertical illuminance values.
2. Documentation for compliant paving materials indicating the SRI, SR, and permeability.
3. Documentation for compliant roofing materials indicating the SRI.
4. Product Data and certification for WaterSense-labeled water fixtures.
5. Product Data for plumbing fixtures indicating flush or flow rate.
6. Documentation complying with Division 01Sections "General Commissioning Requirements," and "Exterior Enclosure Commissioning," Division 21 Section "Commissioning of Fire Suppression," Division 22 Section "Commissioning of Plumbing," Division 23 Section "Commissioning of HVAC," and Division 26 Section "Commissioning of Electrical Systems."

1.6 SUSTAINABLE DESIGN DOCUMENTATION SUBMITTALS:

A. Plumbing submittal packages.

B. Mechanical submittal packages.

C. Documentation for products that comply with LEED v4.1 requirements for Heat Island Reduction. Include the following:

1. Documentation for compliant paving materials indicating the SRI, SR, and permeability.
2. Documentation for compliant roofing materials indicating the SRI.

D. Documentation for products that comply with LEED v4.1 requirements for Building Product Disclosure and Optimization (BPDO) Sourcing of Raw Materials. Include the following:

1. Product data and certification letter from product manufacturers, indicating participation in an extended producer responsibility program in the form of a take-back or recycling program for the product purchased. Include statement indicating cost for each applicable product.
2. Product data and certification for bio-based materials tested in compliance with ASTM Test Method D6866, indicating that they comply with requirements. Include % of biobased content and statement of costs.
3. Product data and chain-of-custody certificates for products containing certified wood. Include statement of costs.

    a. Documentation indicating % of FSC wood content in product
    b. Chain-of-Custody Certificates for certified wood products
    c. Chain-of-Custody qualification data for manufacturer and final vendor.
    d. Itemized invoice from final vendor will be required after approval and purchase, for inclusion in LEED documentation package. Final invoice must include itemized cost and % FSC per wood product, vendor COC number, delivery address matching the job site address.

4. Receipts for salvaged and refurbished materials used for Project, indicating sources and costs.
5. Product data and certification letter from product manufacturers, indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement of costs.
6. Documentation for regional materials, indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material and costs of regional materials.

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E. Documentation complying with Section 017419 "Construction and Demolition Waste Management."

1. At least 50 percent, by volume, of construction and demolition waste produced by the project diverted from landfill, that comply with LEED requirements for Construction and Demolition Waste Management v4.1.

F. Documentation for interior wet-applied adhesive and sealant products in compliance with LEED v4.1 criteria for Low-emitting Materials. Include the following:

1. Product Data: For wet applied adhesives and sealants, indicating VOC content.
2. Laboratory Test Reports: For all wet-applied adhesives and sealants, indicating compliance with requirements for VOC emissions testing in the form of CDPH Standard Method v1.2 compliance verification.

G. Documentation for interior wet-applied paint and coating products in compliance with LEED v4.1 criteria for Low-emitting Materials. Include the following:

1. Product Data: For wet applied paints and coatings, indicating VOC content.
2. Laboratory Test Reports: For wall-, ceiling- or floor-applied paints and coatings, indicating compliance with requirements for VOC emissions testing in the form of CDPH Standard Method v1.2 compliance verification.

H. Documentation for interior flooring products in compliance with LEED v4.1 criteria for Low-emitting Materials. Include the following:

1. Product Certificates: For flooring, documentation indicating compliance with testing and product requirements of CRI's "Green Label Plus" program or VOC emissions testing certificate verifying compliance with CDPH Standard Method v1.2.
2. Product Certificates: For hard surface flooring, documentation from an independent testing agency indicating VOC emissions testing compliance with the FloorScore Standard or CDPH Standard Method v1.2.

I. Documentation for interior ceiling products in compliance with LEED v4.1 criteria for Low-emitting Materials. Include the following:

1. Laboratory Testing: For applicable materials, indicating VOC emissions testing compliance in the form of CDPH Standard Method v1.2 compliance verification.

J. Documentation for interior insulation products in compliance with LEED v4.1 criteria for Low-emitting Materials. Include the following:

1. Laboratory Testing: For applicable materials, indicating VOC emissions testing compliance in the form of CDPH Standard Method v1.2 compliance verification.

K. Documentation that water fixtures that comply with project Water Performance criteria:

1. Indicate compliance with Water Sense standard for showerheads and toilets.
2. Product data confirming fixture flush and flow rates meet efficiency requirements as targeted for LEED.

L. Documentation that energy and gas using equipment and appliances that comply with project Energy and Water Performance criteria:

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1. For Energy Star eligible equipment and appliances, indicate compliance with requirements for Energy Star rating criteria.
2. Product data verifying that all dishwashers meet mandatory requirement of Energy Star certification.
3. Product data verifying that residential style clothes washers meet mandatory requirement of Energy Star certification.
4. Product data verifying that ice machines are air cooled and meet mandatory requirement of Energy Star certification or Energy Star equivalence.

M. Documentation that interior lighting fixtures comply with project criteria:

1. Product data confirming fixtures are LED or contain less than 35 picograms per lumen-hour of mercury content.
2. Product data confirming that all non-decorative lighting fixtures have a color rendering index (CRI) of 90 or higher.

N. Construction Indoor Air Quality (IAQ) Management:

1. Construction IAQ management plan.
2. Product data for temporary filtration media.
3. Product data for filtration media used during occupancy.
4. Construction Documentation: Six photographs at three different times during construction period, along with a brief description of SMACNA approach employed, documenting implementation of IAQ management measures, including protection of ducts and on-site stored or installed absorptive materials.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For LEED coordinator.

B. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:

1. Plumbing.
2. Mechanical.
3. Electrical.
4. Specialty items, such as elevators and equipment.
5. Furniture.
6. Wood-based construction materials excluding components of mechanical, electrical, plumbing or specialty items such as elevators and equipment. Include statement indicating total material cost for all new, permanently-installed wood-based materials used for Project. Material costs exclude labor, equipment, overhead, and profit.

C. Sustainable Design Documentation Submittals:

1. Documentation for products that comply with LEED v4.1 requirements for BPDO Environmental Product Declarations. Include the following:

a. Product specific type III EPDs or Industry wide EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

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2. Documentation for products that comply with LEED v4.1 requirements for BPDO Material Ingredients, Reporting and Optimization. Include the following:

    a. Reporting documentation confirming chemical inventory of products to at least 0.1% (1000 ppm):

        1) Published manufacturer inventory of ingredients identified by name and Chemical Abstract Service Registration Number (CASRN).
        2) Documentation that product has been certified as Cradle to Cradle v2 at the Basic Level or better, or v3 at the Bronze Level or better.
        3) Declare product label.
        4) Documentation that product has been certified at the Bronze level or higher under the Cradle to Cradle Material Health Certificate and that at least 90% of materials are assessed by weight.
        5) Product Lens Certification.
        6) Documentation confirming certification under Facts NSF/ANSI 336 Sustainability Assessment for Commercial Furnishings Fabric at any certification level.
        7) Assessor documentation or scorecard from BIFMA demonstrating that furniture product has earned 3 points under 7.5.1.3 Advanced Level in e3-2014 or 3 points under 7.4.1.3 Advanced Level in e3-2012 for ANSI/BIFMA e3 Furniture Sustainability Standard.

3. Documentation for products that comply with LEED requirements for BPDO Material Ingredient, Optimization. Include one of the following:

    a. Material Ingredient Screening and Optimization Action Plan (valued at 1/2 product): Documentation confirming material ingredient screening to at least 0.1% (1000 ppm), and development of a detailed action plan to mitigate or reduce known hazards using the principles of green chemistry. The action plan must be product specific and must include all of the following:

        1) Description of the screening or assessment platform used.
        2) Identification of the specific green chemistry principles targeted for implementation.
        3) Description of specific steps anticipated in implementation, including proposed changes in formulation or manufacturing processes.
        4) Specific dates and a timeline for completion of steps described.

    b. Advanced Inventory & Assessment (valued at 1 product): Documentation confirming the end use product meets any of the following:

        1) Declare labels designated as Red List Free that are third-party verified.
        2) Cradle to Cradle: Materials Health Certificate or Cradle to Cradle certified under standard version 3 or later, with a Material Health category achievement level at Bronze or higher.
        3) Living Product Challenge certified products with ‘Red List Free’ Declare Label.

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c. Material Ingredient Optimization (valued at 1.5 products): Documentation confirming product inventory and assessment of ingredients using any of the following:

1) Living Product Challenge: Products certified to the Living Product Challenge which includes achievement of Imperative 09: Transparent Material Health.
2) Cradle to Cradle version 3 certified with a Material Health category achievement level at Silver or higher, or a Materials Health Certificate at Silver or higher.

D. Sustainable Design Action Plans: Provide preliminary submittals within **30** days of date established for **the Notice to Proceed**, indicating how the following requirements will be met:

1. Construction IAQ management Plan.
2. Construction Waste Management Plan

E. Sustainable Design Progress Reports: Concurrent with each Application for Payment submit reports comparing actual construction and purchasing activities with sustainable design action plans.

1.8 QUALITY ASSURANCE

A. Sustainable Design Program: The Contractor and Subcontractors shall be responsible for implementing processes, programs, means and methods required to ensure compliance with sustainable design requirements and objectives of the Contract Documents, including but not limited to the following:

1. Reviewing and vetting submittals for technical sections with respect to compliance with Sustainable Design Requirements.
2. Product and Execution requirements specified in various sections of the project specifications.
3. Proposed LEED points that specifically address construction execution issues, material reporting requirements and indoor air quality testing requirements.

B. LEED Compliance Officer: Engage an experienced LEED-accredited professional to coordinate LEED requirements.

1. Qualifications: The LEED Compliance Officer shall have experience with sustainable design issues related to the design and construction of projects of equal size and scope to this one, with at least two years of experience implementing the LEED rating system on other projects.
2. Other Duties: The LEED Compliance Officer shall be assigned to manage construction administration of the Sustainable Design program and may also manage the Waste Management and Construction Indoor Air Quality Programs.

C. Responsibilities of Subcontractors: Each subcontractor shall coordinate LEED submittal requirements and process delivery of certifications and LEED substantiation documents through the Contractor's LEED Compliance Officer, who in turn will coordinate with the A/E Team.

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D. Responsibilities of the LEED Compliance Officer: The LEED Compliance Officer shall perform the following services:

1. General: Take primary responsibility for organizing and managing the process of compiling requirements of the construction-related LEED Points for which each Subcontractor is responsible, including collecting and organizing the documentation required for the Architect/Engineer's submission to the USGBC upon completion of the project.
2. IAQ Program: Develop appropriate and comprehensive Construction Indoor Air Quality (IAQ) Management Plan, as required under the LEED Construction Indoor Air Quality Management Credit. The LEED Compliance Officer shall be responsible for implementing construction activity pollution prevention, verifying compliance, enforcing, and documenting implementation of the Construction IAQ Management Plan. Each Subcontractor shall comply with the requirements of this program.
3. Construction Waste Management: Develop a Construction Waste Management Plan, as required under the LEED Construction Waste Management Planning credit for diversion of waste from landfill. The Contractor shall be responsible for verifying compliance, enforcing and documenting implementation of the Construction Waste Management Plan.
4. LEED Compliant Materials: Assist the Subcontractors in identifying and obtaining supporting documentation for products that satisfy the specified sustainable design and specified product requirements (for example, low emitting materials; recycled content; and other items listed in this Section). Each Subcontractor shall coordinate with the LEED Compliance Officer and provide documentation in a timely manner as required for filing by the A/E team.
5. LEED Progress Meetings: Assist the LEED Project Manager in coordinating regularly scheduled LEED progress meetings consisting of appropriate members of the Contractor, Subcontractors, Architect/Engineer, Commissioning Agent and the Owner’s Representative.
6. Schedules and Tracking: Prepare schedules and tracking documentation for circulation to construction contracting team members for the purposes of organizing the sustainable design compliance responsibilities of each team member.
7. Observation and Inspection: Perform periodic on-site observations and inspections of the work in progress in order to verify conformance with all required sustainable design requirements. These observations shall occur not less than once per week.
8. Documentation: Provide documentation content for the formal LEED submission package, as required by the US Green Building Council to verify conformance with the LEED rating system.

E. The services described above (by the LEED Compliance Officer) shall not preclude nor substitute for the requirements of other dedicated sustainable design related services that the project may require, (such as an industrial hygienist that may be required to satisfy specific LEED point requirements for construction indoor air quality control), or for general construction supervision required on a full or part-time basis.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide products and procedures necessary to obtain LEED credits indicated as Contractor's responsibility. Although other Sections may specify some requirements that contribute to these LEED credits, Contractor provides additional materials and procedures necessary to obtain LEED credits indicated.

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B. At least 40 different products from at least five different manufacturers have EPDs that comply with LEED requirements. Product-specific Type III EPDs are valued as one and one-half of a product.

1. Products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at twice their base contributing number of products, up to a maximum of 2 products.

C. At least 20 different products from at least five different manufacturers comply with LEED requirements for material ingredient reporting. At least 5 of these products, from at least three different manufacturers comply with LEED requirements for material ingredient optimization.

1. Products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at twice their base contributing number of products, up to a maximum of 2 products.

D. Use products sourced from at least three different manufacturers that meet at least one of the responsible sourcing and extraction criteria below for at least 15%, by cost, of the total value of permanently installed building products in the project. Products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at twice their base contributing number of products, up to a maximum of 2 products.

1. Recycled content: Building materials have recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content for Project constitutes a minimum of 15 percent of cost of materials used for Project.

a. Cost of postconsumer recycled content plus one-half of preconsumer recycled content of an item to be determined by dividing weight of postconsumer recycled content plus one-half of preconsumer recycled content in the item by total weight of the item and multiplying by cost of the item.
b. Do not include plumbing, mechanical and electrical components, and specialty items, such as elevators and equipment, in the calculation.
c. Recycled (Recovered) Material Content Requirements: Unless otherwise specified, the following are minimum recovered material content requirements for products listed:

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A. Table: Minimum Recycled (Recovered) Material Content Requirements

Div	Material Category	Minimum Recycled (Recovered) Content (by weight)	Ref #
05	Framing steel, made using EAF (electric arc furnace)	97% total; 64% post-consumer	2
	Steel sheet metal, made using BOF (basic oxygen furnace)	30% total; 17% post-consumer	2
06	Laminated paperboard (sheathing, under-layment, subflooring)	100%	1
	Countertops, solid-surface plastic	100% post-consumer	6
	Plastic lumber, non-structural	100%	1
07	Building insulation, mineral wool batt or board	75%	1
	Building insulation, fiberglass batt or board	25%	1
	Building insulation, polyisocyanurate, polyu-rethane	9%	1
	Building insulation, foam-in-place rigid foam	5%	1
	Building insulation, perlite composite board	75% post-consumer paper	1
	Building insulation, cotton and/or polyester batt	100%	6
	Building insulation, plastic non-woven batt	100% recovered plastic	1
	Building insulation, cellulose, loose-fill or spray-in	95% post consumer	6
	Applied fireproofing	100%	6
	Roofing, steel	100% total; 67% post-consumer	5
	Roofing, aluminum	95%	5
	Roofing, fiber (felt)	100%	5
	Roofing, rubber	100%	5
	Roofing, plastic or plastic/rubber composite	100%	5
	Roofing, wood/plastic composite	100%	5

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09	Gypsum board gypsum core	98% recycled or synthetic gypsum	7
	Gypsum board facing paper	100% post-consumer newsprint	6
	Steel studs, runners, and channels	30%	2
	Acoustic ceiling tiles	65%	7
	Ceiling suspension system, steel	30%	2
	Ceramic tile	50%	6
	Rubber flooring	95%	1
	Carpet, polyester face fiber	100% PET (Polyethylene Terephthalate)	1
	Carpet, nylon face fiber	25%	5
	Carpet backing, vinyl	100%	5
	Carpet cushion, bonded polyurethane	50%	1
	Carpet cushion, jute	40% burlap	1
	Carpet cushion, synthetic fiber	100% carpet fabrication scrap	1
	Carpet cushion, rubber	90%	1
	Fabric wrapped tack panel core	100% post-consumer paper	6
10	Shower and restroom partitions, plastic	100%	1
	Restroom partitions, metal	100%	1
	Signage, plastic	100%	1
	Signage, aluminum	25%	1
	Signage, steel	30%	1
11	Loading dock bumpers, rubber	100%	6
12	Entrance mats, rubber	100%	6
	Office furniture, PET fabric	100%	5
22	Non-pressure pipe, steel	100% total; 67% post-consumer	5
	Non-pressure pipe, HDPE	100%	5
	Non-pressure pipe, PVC	100%	5
32	Geotextile, synthetic	100%	6
	Hydromulch	100% post-consumer paper	1
	Unit pavers, rubber and/or plastic	95%	1
	Paving, grass- or gravel-filled structural grid system	100%	6
	Paving, asphalt	50% RAP (reclaimed asphalt paving)	5
	Paving, rubber modified (RMA)	25%	5
	Paving, “glassphalt”	10% recycled glass cullet aggregate	5
	Drip irrigation hose	70%	1
	Parking appurtenances, concrete	70%	1
	Parking appurtenances, plastic and/or rubber	100%	1

Table A References for Minimum Recovered Material Content Requirements:

1. US EPA “Wastes - Resource Conservation - Comprehensive Procurement Guidelines” (http://www.epa.gov/epawaste/conserve/tools/cpg/) (latest update as of October 2007).
2. This standard references Steel Recycling Institute (http://www.recycle-steel.org) published industry averages for recycled steel content. Meeting these criteria ensures that products meet or exceed the industry trends for recycling.
3. Green Seal Standard “Watering Hoses (GC-01)”, Second Edition, April 4, 1994
4. EPA Recovered Materials Advisory Notice (RMAN), August 28, 2001 TxDOT

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(http://www.dot.state.tx.us) recommendations for recycled content in asphalt. Contact TxDOT for additional information.
5. Products that meet this standard are widely available throughout North America.
6. No standard is cited for this requirement.

2. Certified Wood: Not less than 25 percent, by cost, of new wood-based materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.

3. Biobased Content: Building materials shall have bio-based content constituting not less than 2 percent of cost of materials used for Project.

4. Extended Producer Responsibility Program: Not less than 5 percent of building materials, by cost, shall be manufactured by a participant in an extended producer responsibility program.

2.2 LOW-EMITTING MATERIALS

A. Paints and Coatings: For field applications that are inside the weatherproofing system:

1. 75 percent of paints and coatings (by volume or area) shall comply with the requirements of CDPH Standard Method v1.2.
2. 100 percent of paints and coatings shall comply with VOC content limits of authorities having jurisdiction and South Coast Air Quality Management Board (SCAQMD) Rule 1113 (effective Feb. 5, 2016):

    a. Flat Paints and Coatings: 50 g/L.
    b. Nonflat Paints and Coatings: 50 g/L.
    c. Dry-Fog Coatings: 150 g/L.
    d. Primers, Sealers, and Undercoaters: 100 g/L.
    e. Rust-Preventive Coatings: 100 g/L.
    f. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
    g. Pretreatment Wash Primers: 420 g/L.
    h. Clear Wood Finishes, Varnishes: 275 g/L.
    i. Clear Wood Finishes, Lacquers: 275 g/L.
    j. Floor Coatings: 50 g/L.
    k. Shellacs, Clear: 730 g/L.
    l. Shellacs, Pigmented: 550 g/L.
    m. Stains: 100 g/L.

B. Adhesives and Sealants: For field applications that are inside the weatherproofing system:

1. 75 percent of paints and coatings (by volume or area) shall comply with the requirements of CDPH Standard Method v1.2.
2. 100 percent of paints and coatings shall comply with VOC content limits of authorities having jurisdiction and South Coast Air Quality Management Board (SCAQMD) Rule 1168 (effective Oct. 6, 2017):

    a. Wood Glues: 30 g/L.
    b. Metal-to-Metal Adhesives: 30 g/L.
    c. Adhesives for Porous Materials (except Wood): 50 g/L.
    d. Subfloor Adhesives: 50 g/L.
    e. Plastic Foam Adhesives: 50 g/L.
    f. Carpet Adhesives: 50 g/L.

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g. Carpet Pad Adhesives: 50 g/L.
h. VCT and Asphalt Tile Adhesives: 50 g/L.
i. Cove Base Adhesives: 50 g/L.
j. Gypsum Board and Panel Adhesives: 50 g/L.
k. Rubber Floor Adhesives: 60 g/L.
l. Ceramic Tile Adhesives: 65 g/L.
m. Multipurpose Construction Adhesives: 70 g/L.
n. Fiberglass Adhesives: 80 g/L.
o. Contact Adhesives: 80 g/L.
p. Structural Glazing Adhesives: 100 g/L.
q. Wood Flooring Adhesives: 100 g/L.
r. Structural Wood Member Adhesives: 140 g/L.
s. Single-Ply Roof Membrane Adhesives: 250 g/L.
t. Special-Purpose Contact Adhesives (That Are Used to Bond Melamine-Covered Board,
u. Metal, Unsupported Vinyl, Rubber, or Wood Veneer 1/16 Inch (1.6 mm) or less in Thickness to Any Surface): 250 g/L.
v. Top and Trim Adhesives: 250 g/L.
w. Plastic Cement Welding Compounds: 250 g/L.
x. ABS Welding Compounds: 325 g/L.
y. CPVC Welding Compounds: 490 g/L.
z. PVC Welding Compounds: 510 g/L.
aa. Adhesive Primer for Plastic: 550 g/L.
bb. Sheet-Applied Rubber Lining Adhesives: 850 g/L.
cc. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
dd. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
ee. Special-Purpose Aerosol Adhesives (All Types): 70 percent by weight.
ff. Other Adhesives: 250 g/L.
gg. Architectural Sealants: 250 g/L.
hh. Nonmembrane Roof Sealants: 300 g/L.
ii. Single-Ply Roof Membrane Sealants: 450 g/L.
jj. Other Sealants: 420 g/L.
kk. Sealant Primers for Nonporous Substrates: 250 g/L.
ll. Sealant Primers for Porous Substrates: 775 g/L.
mm. Modified Bituminous Sealant Primers: 500 g/L.
nn. Other Sealant Primers: 750 g/L.
oo. Adhesives and Sealants: For field applications.

C. Flooring: A minimum of 90 percent of flooring products (by cost or area) meet the VOC emissions evaluation of CDPH Standard Method v1.2 or inherently non-emitting sources criteria or salvaged and reused materials criteria. Subflooring is excluded.

D. Ceilings: A minimum of 90 percent of ceilings (by cost or area) meet the VOC emissions evaluation of CDPH Standard Method v1.2 or inherently non-emitting sources criteria or salvaged and reused materials criteria. Ceiling products include ceiling panels, ceiling tile, surface ceiling structures, suspended systems, and glazed skylights. Overhead structural elements are excluded.

E. Insulation: A minimum of 75 percent of insulation products (by cost or area) meet the VOC emissions evaluation of CDPH Standard Method v1.2. Insulation products include all thermal and acoustic boards, batts, rolls, blankets, sound attenuation fire blankets, and foamed-in-place, loose-fill, blown, and sprayed insulation. HVAC duct and plumbing piping insulation are excluded.

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F. Composite Wood: A minimum of 75 percent of all (structural and non-structural) composite wood meet the formaldehyde emissions evaluation or salvaged and reused materials criteria. Composite wood materials include particleboard, MDF, hardwood veneer plywood, and structural composite wood.

PART 3 - EXECUTION

3.1 NON-SMOKING BUILDING

A. Smoking is not permitted within the building or within 25 ft. (8 meters) of entrances, operable windows, or outdoor-air intakes.

3.2 CONSTRUCTION WASTE MANAGEMENT

A. Comply with Section 017410 "LEED Construction Waste Management."

3.3 CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT

A. Comply with Section 015731 "LEED Indoor Air Quality Management."

END OF SECTION 018113

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SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Owner's Project Requirements and Basis-of-Design documentation are referenced for information only.

1.2 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. General requirements for coordinating and scheduling commissioning activities.
2. Commissioning meetings.
3. Commissioning reports.
4. Use of commissioning process test equipment, instrumentation, and tools.
5. Construction checklists, including, but not limited to, installation checks, startup, performance tests, and performance test demonstration.
6. Commissioning tests and commissioning test demonstration.
7. Adjusting, verifying, and documenting identified systems and assemblies.

C. Related Requirements:

1. Division 01 Section "Summary" for Commissioning Authority responsibilities.
2. Division 01 Section "Submittal Procedures" for submittal procedure requirements for commissioning process.
3. Division 01 Section "Closeout Procedures" for Certificate of Construction-Phase Commissioning Process Completion submittal requirements.
4. Division 01 Section "Operation and Maintenance Data" for preliminary operation and maintenance data submittal requirements.
5. Division 01 Section "Exterior Enclosure Commissioning" for technical commissioning requirements for exterior closure.
6. Division 21 Section "Commissioning of Fire Suppression" for technical commissioning requirements for fire suppression.
7. Division 22 Section "Commissioning of Plumbing" for technical commissioning requirements for plumbing.
8. Division 23 Section "Commissioning of HVAC" for technical commissioning requirements for HVAC.
9. Division 26 Section "Commissioning of Electrical Systems" for technical commissioning requirements for electrical systems.
10. Division 27 Section "Commissioning of Communications" for technical commissioning requirements for communications systems.
11. Division 28 Section "Commissioning of Electronic Safety and Security" for technical commissioning requirements for electronic safety and security systems.

D. Commissioning Plan:

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1. Comply with project requirements intended to achieve a certified rating, measured and documented according to the United States Green Building Council LEED Green Building rating system.
2. The commissioning process will include the completion of the LEED Energy & Atmosphere Prerequisite 1 – Fundamental Commissioning of Building Energy Systems, Energy and Atmosphere Credit 3.

1.3 ALLOWANCES

A. Labor and management costs for the performance of commissioning process.

B. The following are excluded from the commissioning allowance:

1. Equipment and systems installation, startup, and field quality-control testing indicated in the Contract Documents.
2. Test equipment, instrumentation, and tools (including, but not limited to, proprietary test equipment, instrumentation, and tools) required to perform tests.
3. Work to correct commissioning issues.
4. Work to repeat tests when equipment and systems fail acceptance criteria.

1.4 UNIT PRICES

A. Commissioning allowance may be adjusted up or down by the "List of Unit Prices" Article in Division 01 Section "Unit Prices" when actual labor hours are computed at the end of commissioning process. See Division 01 Section "Allowances" for commissioning allowance.

B. The following are excluded from the computation for the adjustment of the commissioning allowance for technician labor hours:

1. Work to correct commissioning issues.
2. Work to repeat tests when equipment and systems fail acceptance criteria.

1.5 DEFINITIONS

A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.

B. Basis of Design BoD: A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

C. Commissioning Authority CxA: An entity engaged by Owner, and identified in Division 01 Section "Summary," to evaluate Commissioning-Process Work.

D. Commissioning Plan: A document prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

E. Commissioning: A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with

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Owner's Project Requirements. The requirements specified here are limited to the construction phase commissioning activities. The scope of the commissioning process is defined in Division 01 Section "Summary."

F. Construction-Phase Commissioning-Process Completion: The stage of completion and acceptance of commissioning process when resolution of deficient conditions and issues discovered during commissioning process and retesting until acceptable results are obtained has been accomplished. Owner will establish in writing the date construction-phase commissioning-process completion is achieved. See Division 01 Section "Closeout Procedures" for Certificate of Construction-Phase Commissioning Process Completion submittal requirements.

1. Commissioning process is complete when the Work specified of this Section and related Sections has been completed and accepted, including, but not limited to, the following:

a. Completion of tests and acceptance of test results.
b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
c. Comply with requirements in Division 01 Section "Demonstration and Training."
d. Completion and acceptance of submittals and reports.

G. Owner's Project Requirements OPR. A document that details the functional requirements of a project and the expectations of how it will be used and operated, including Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria and supporting information. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

H. Owner's Witness: Commissioning Authority, Owner's Project Manager, or Architect-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.

I. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.

J. Test: Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.

K. Sampling Procedures and Tables for Inspection by Attributes: As defined in ASQ Z1.4.

1.6 INFORMATIONAL SUBMITTALS

A. Comply with requirements in Division 01 Section "Submittal Procedures" for submittal procedure general requirements for commissioning process.

B. Commissioning Plan Information:

1. List of Contractor-appointed commissioning team members to include specific personnel and subcontractors performing the various commissioning requirements.
2. Schedule of commissioning activities, integrated with the Construction Schedule. Comply with requirements in Division 01 Section "Construction Progress Documentation" for the Construction Schedule general requirements for commissioning process.
3. Contractor personnel and subcontractors participating in each test.

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4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.

C. Commissioning schedule.

D. Two-week look-ahead schedules.

E. Commissioning Coordinator Letter of Authority:

1. Within 10 days after approval of Commissioning Coordinator qualifications, submit a letter of authority for Commissioning Coordinator, signed by a principal of Contractor's firm. Letter shall authorize Commissioning Coordinator to do the following:

    a. Make inspections required for commissioning process.
    b. Coordinate, schedule, and manage commissioning process of Contractor, subcontractors, and suppliers.
    c. Obtain documentation required for commissioning process from Contractor, subcontractors, and suppliers.
    d. Report issues, delayed resolution of issues, schedule conflicts, and lack of cooperation or expertise on the part of members of the commissioning team.

F. Commissioning Coordinator Qualification Data: For entity coordinating Contractor's commissioning activities to demonstrate their capabilities and experience.

1. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

G. List test instrumentation, equipment, and monitoring devices. Include the following information:

1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.
2. Brief description of intended use.
3. Calibration record showing the following:

    a. Calibration agency, including name and contact information.
    b. Last date of calibration.
    c. Range of values for which calibration is valid.
    d. Certification of accuracy.
    e. Certification for calibration equipment traceable to NIST.
    f. Due date of the next calibration.

H. Test Reports:

1. Pre-Startup Report: Prior to startup of equipment or a system, submit signed, completed construction checklists.
2. Test Data Reports: At the end of each day in which tests are conducted, submit test data for tests performed.
3. Commissioning Issue Reports: Daily, at the end of each day in which tests are conducted, submit commissioning issue reports for tests for which acceptable results were not achieved.
4. Weekly Progress Report: Weekly, at the end of each week in which tests are conducted, submit a progress report.

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5. Data Trend Logs: Submit data trend logs at the end of the trend log period.
6. System Alarm Logs: Daily, at the start of days following a day in which tests were performed, submit printout of log of alarms that occurred since the last log was printed.

I. Construction Checklists:

1. Material checks.
2. Installation checks.
3. Startup procedures, where required.

1.7 CLOSEOUT SUBMITTALS

A. Commissioning Report:

1. At Construction-Phase Commissioning Completion, include the following:

a. Pre-startup reports.
b. Approved test procedures.
c. Test data forms, completed and signed.
d. Progress reports.
e. Commissioning issue report log.
f. Commissioning issue reports showing resolution of issues.
g. Correspondence or other documents related to resolution of issues.
h. Other reports required by commissioning process.
i. List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction-Phase Commissioning Completion.
j. Report shall include commissioning work of Contractor.

B. Request for Certificate of Construction-Phase Commissioning Process Completion.

C. Operation and Maintenance Data: For proprietary test equipment, instrumentation, and tools to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Commissioning Coordinator Qualifications:

1. Documented experience commissioning systems of similar complexity to those contained in these documents on at least three projects of similar scope and complexity.
2. Certification of commissioning-process expertise. The following certifications are acceptable. Owner reserves the right to accept or reject certifications as evidence of qualification.

a. Certified Commissioning Authority, by AABC Commissioning Group (ACG).
b. Commissioning-Process Management Professional, by American Society of Heating, Refrigerating and Air-Conditioning Engineers.
c. Certified Commissioning Professional, by Building Commissioning Association.
d. Accredited Commissioning-Process Authority.
e. Accredited Commissioning-Process Manager.
f. Accredited Green Commissioning-Process Provider.

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B. Calibration Agency Qualifications: Certified by The American Association for Laboratory Accreditation that the calibration agency complies with minimum requirements of ISO/IEC 17025.

1.9 COMPENSATION

A. If Architect, Commissioning Authority, other Owner's witness, or Owner's staff perform additional services or incur additional expenses due to actions of Contractor listed below, compensate Owner for such additional services and expenses.

1. Failure to provide timely notice of commissioning activities schedule changes.
2. Failure to meet acceptance criteria for test demonstrations.

B. Contractor shall compensate Owner for such additional services and expenses at the rate of $200.00 per labor hour, plus $1,000 per round trip for personnel travelling more than 200 miles, plus per diem allowances for meals and lodging according to current U.S. General Services Administration (GSA) Per Diem Rates.

1.10 COMMISSIONING TEAM

A. Members Appointed by Contractor(s):

1. Commissioning Coordinator: A person or entity employed by Contractor to manage, schedule, and coordinate commissioning process.
2. Project superintendent and other employees that Contractor may deem appropriate for a particular portion of the commissioning process.
3. Subcontractors, installers, suppliers, and specialists that Contractor may deem appropriate for a particular portion of the commissioning process.
4. Appointed team members shall have the authority to act on behalf of the entity they represent.

B. Members Appointed by Owner:

1. Commissioning Authority, plus consultants that Commissioning Authority may deem appropriate for a particular portion of the commissioning process.
2. Owner representative(s), facility operations and maintenance personnel, plus other employees, separate contractors, and consultants that Owner may deem appropriate for a particular portion of the commissioning process.
3. Architect, plus employees and consultants that Architect may deem appropriate for a particular portion of the commissioning process.

1.11 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA andContractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BoD documentation, prepared by Architect/Engineer and approved by Owner, to the CxA andContractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

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1.12 CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
3. Attend commissioning team meetings held on a variable basis.
4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review and accept construction checklists provided by the CxA.
6. Complete electronic construction checklists as Work is completed and provide to the Commissioning Authority on a weekly basis.
7. Review and accept commissioning process test procedures provided by the Commissioning Authority.
8. Complete commissioning process test procedures.

1.13 CxA'S RESPONSIBILITIES

A. Organize and lead the commissioning team.

B. Provide commissioning plan.

C. Convene commissioning team meetings.

D. Provide Project-specific construction checklists and commissioning process test procedures.

E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.

F. Prepare and maintain the Issues Log.

G. Prepare and maintain completed construction checklist log.

H. Witness systems, assemblies, equipment, and component startup.

I. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Test equipment and instrumentation required to perform the commissioning process shall remain the property of Contractor unless otherwise indicated.

B. Test equipment and instrumentation required to perform commissioning process shall comply with the following criteria:

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1. Be manufactured for the purpose of testing and measuring tests for which they are being used and have an accuracy to test and measure system performance within the tolerances required to determine acceptable performance.
2. Calibrated and certified.

    a. Calibration performed and documented by a qualified calibration agency according to national standards applicable to the tools and instrumentation being calibrated. Calibration shall be current according to national standards or within test equipment and instrumentation manufacturer's recommended intervals, whichever is more frequent, but not less than within six months of initial use on Project. Calibration tags shall be permanently affixed.
    b. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.

3. Maintain test equipment and instrumentation.
4. Use test equipment and instrumentation only for testing or monitoring Work for which they are designed.

2.2 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate, or perform work on its equipment.

1. Identify proprietary test equipment, instrumentation, and tools required in the test equipment identification list submittal.
2. Proprietary test equipment, instrumentation, and tools shall become the property of Owner at Substantial Completion.

2.3 REPORT FORMAT AND ORGANIZATION

A. General Format and Organization:

1. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.

B. Commissioning Report:

1. Include a table of contents and an index to each test.
2. Include major tabs for each Specification Section.
3. Include minor tabs for each test.
4. Within each minor tab, include the following:

    a. Test specification.
    b. Pre-startup reports.
    c. Approved test procedures.
    d. Test data forms, completed and signed.
    e. Commissioning issue reports, showing resolution of issues, and documentation related to resolution of issues pertaining to a single test. Group data forms, commissioning issue reports showing resolution of issues, and documentation related to resolution of issues for each test repetition together within the minor tab, in reverse chronological order (most recent on top).

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PART 3 - EXECUTION

3.1 PREPARATION

A. Review preliminary construction checklists and preliminary test procedures and data forms.

3.2 CONSTRUCTION CHECKLISTS

A. Construction checklists cannot modify or conflict with the Contract Documents.

B. Create construction checklists based on actual systems and equipment to be included in Project.

C. Material Checks: Compare specified characteristics and approved submittals with materials as received. Include factory tests and other evaluations, adjustments, and tests performed prior to shipment if applicable.

1. Service connection requirements, including configuration, size, location, and other pertinent characteristics.
2. Included optional features.
3. Delivery Receipt Check: Inspect and record physical condition of materials and equipment on delivery to Project site, including agreement with approved submittals, cleanliness, and lack of damage.
4. Installation Checks:

    a. Location according to Drawings and approved Shop Drawings.
    b. Configuration.
    c. Compliance with manufacturers' written installation instructions.
    d. Attachment to structure.
    e. Access clearance to allow for maintenance, service, repair, removal, and replacement without the need to disassemble or remove other equipment or building elements. Access coordinated with other building elements and equipment, including, but not limited to, ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.
    f. Utility connections are of the correct characteristics, as applicable.
    g. Correct labeling and identification.
    h. Startup Checks: Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.

D. Startup: Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, at minimum.

E. Performance Tests:

1. Static Tests: As specified elsewhere, including, but not limited to, duct and pipe leakage tests, insulation-resistance tests, and water-penetration tests.
2. Component Performance Tests: Tests evaluate the performance of an input or output of components under a full range of operating conditions.
3. Equipment and Assembly Performance Tests: Test and evaluate performance of equipment and assemblies under a full range of operating conditions and loads.
4. System Performance Tests: Test and evaluate performance of systems under a full range of operating conditions and loads.

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5. Intersystem Performance Tests: Test and evaluate the interface of different systems under a full range of operating conditions and loads.

F. Deferred Construction Checklists: Obtain Owner approval of proposed deferral of construction checklists, including proposed schedule of completion of each deferred construction checklist, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. When approved, deferred construction checklists may be completed after date of Construction-Phase Commissioning Completion. Include the following in a request for Certificate of Construction-Phase Commissioning Process Completion:

1. Identify deferred construction checklists by number and title.
2. Provide a target schedule for completion of deferred construction checklists.
3. Written approval of proposed deferred construction checklists, including approved schedule of completion of each deferred construction checklist.

G. Delayed Construction Checklists: Obtain Owner approval of proposed delayed construction checklists, including proposed schedule of completion of each delayed construction checklist, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. When approved, delayed construction checklists may be completed after date of Construction-Phase Commissioning Completion. Include the following in a request for Certificate of Construction-Phase Commissioning Process Completion:

1. Identify delayed construction checklist by construction checklist number and title.
2. Provide a target schedule for completion of delayed construction checklists.
3. Written approval of proposed delayed construction checklists, including approved schedule of completion of each delayed construction checklist.

3.3 GENERAL EXECUTION REQUIREMENTS

A. Schedule and coordinate commissioning process with the Construction Schedule.

B. Perform activities identified in construction checklists, including tests, and document results of actions as construction proceeds.

C. Perform test demonstrations for Owner's witness. Unless otherwise indicated, demonstrate tests for 100 percent of work to which the test applies. In some instances, demonstration of a random sample of other than 100 percent of the results of a test is specified.

1. Where sampling is specified, the sampling plan and procedure for the test demonstration shall be determined using ASQ Z1.4.

    a. General Inspection: Level I.
    b. Special Inspection: Level S-1.
    c. Acceptance Quality Limit (AQL) of 1.5.

2. The "lot size" in ASQ Z1.4 is the sum of the number of items to which the test demonstration applies, as described in the scope subparagraph of each test.
3. On determination of the sample size, the samples shall be selected randomly by Owner's witness at the time of the test demonstration.
4. Include in the Commissioning Plan a detailed list of the test demonstrations with lot and sample quantities for each test.

D. Report test data and commissioning issue resolutions.

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E. Schedule personnel to participate in and perform Commissioning-Process Work.

F. Installing contractors' commissioning responsibilities include, but are not limited to, the following:

1. Operating the equipment and systems they install during tests.
2. In addition, installing contractors may be required to assist in tests of equipment and systems with which their work interfaces.

3.4 COMMISSIONING COORDINATOR RESPONSIBILITIES

A. Management and Coordination: Manage, schedule, and coordinate commissioning process, including, but not limited to, the following:

1. Coordinate with subcontractors on their commissioning responsibilities and activities.
2. Obtain, assemble, and submit commissioning documentation.
3. Conduct periodic on-site commissioning meetings. Comply with requirements in Division 01 Section "Project Management and Coordination."
4. Develop and maintain the commissioning schedule. Integrate commissioning schedule into the Construction Schedule. Update Construction Schedule at specified intervals.
5. Review and comment on preliminary test procedures and data forms.
6. Report inconsistencies and issues in system operations.
7. Verify that tests have been completed and results comply with acceptance criteria, and that equipment and systems are ready before scheduling test demonstrations.
8. Direct and coordinate test demonstrations.
9. Coordinate witnessing of test demonstrations by Owner's witness.
10. Coordinate and manage training. Be present during training sessions to direct video recording, present training, and direct the training presentations of others. Comply with requirements in Division 01 Section "Demonstration and Training."
11. Prepare and submit specified commissioning reports.
12. Track commissioning issues until resolution and retesting is successfully completed.
13. Retain original records of Commissioning-Process Work, organized as required for the commissioning report. Provide Owner's representative access to these records on request.
14. Assemble and submit commissioning report.

3.5 COMMISSIONING TESTING

A. Quality Control: Construction checklists, including tests, are quality-control tools designed to improve the functional quality of Project. Test demonstrations evaluate the effectiveness of Contractor's quality-control process.

B. Owner's witness will be present to witness commissioning work requiring the signature of an owner's witness, including, but not limited to, test demonstrations. Owner's project manager will coordinate attendance by Owner's witness with Contractor's published Commissioning Schedule. Owner's witness will provide no labor or materials in the commissioning work. The only function of Owner's witness will be to observe and comment on the progress and results of commissioning process.

C. Construction Checklists:

1. Complete construction checklists as Work is completed.
2. Distribute construction checklists to installing contractors before they start work.

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3. Installers:

    a. Verify installation using approved construction checklists as Work proceeds.
    b. Complete and sign construction checklists weekly for work performed during the preceding week.

4. Provide Commissioning Authority access to construction checklists.

D. Installation Compliance Issues: Record as an installation compliance issue Work found to be incomplete, inaccessible, at variance with the Contract Documents, nonfunctional, or that does not comply with construction checklists. Record installation compliance issues on the construction checklist at the time they are identified. Record corrective action and how future Work should be modified before signing off the construction checklist.

E. Pre-Startup Audit: Prior to executing startup procedures, review completed installation checks to determine readiness for startup and operation. Report conditions, which, if left uncorrected, adversely impact the ability of systems or equipment to operate satisfactorily or to comply with acceptance criteria. Prepare pre-startup report for each system.

F. Test Procedures and Test Data Forms:

1. Test procedures shall define the step-by-step procedures to be used to execute tests and test demonstrations.
2. Test procedures shall be specific to the make, model, and application of the equipment and systems being tested.
3. Completed test data forms are the official records of the test results.
4. Commissioning Authority will provide to Contractor preliminary test procedures and test data forms for performance tests and commissioning tests after approval of Product Data, Shop Drawings, and preliminary operation and maintenance manual.
5. Review preliminary test procedures and test data forms, and provide comments within 14 days of receipt from Commissioning Authority. Review shall address the following:

    a. Equipment protection and warranty issues, including, but not limited to, manufacturers' installation and startup recommendations, and operation and maintenance instructions.
    b. Applicability of the procedure to the specific software, equipment, and systems approved for installation.

6. After Contractor has reviewed and commented on the preliminary test procedures and test data forms, Commissioning Authority will revise and reissue the approved revised test procedures and test data forms marked "Approved for Testing."
7. Use only approved test procedures and test data forms marked "Approved for Testing" to perform and document tests and test demonstrations.

G. Performance of Tests:

1. The sampling rate for tests is 100 percent. The sampling rate for test demonstrations is 100 percent unless otherwise indicated.
2. Perform and complete each step of the approved test procedures in the order listed.
3. Record data observed during performance of tests on approved data forms at the time of test performance and when the results are observed.
4. Record test results that are not within the range of acceptable results on commissioning issue report forms in addition to recording the results on approved test procedures and

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data forms according to the "Commissioning Compliance Issues" Paragraph in this Article.

5. On completion of a test, sign the completed test procedure and data form. Tests for which test procedures and data forms are incomplete, not signed, or which indicate performance that does not comply with acceptance criteria will be rejected. Tests for which test procedures and data forms are rejected shall be repeated and results resubmitted.

H. Performance of Test Demonstration:

1. Perform test demonstrations on a sample of tests after test data submittals are approved. The sampling rate for test demonstrations shall be 100 percent unless otherwise indicated in the individual test specification.
2. Notify Owner's witness at least three days in advance of each test demonstration.
3. Perform and complete each step of the approved test procedures in the order listed.
4. Record data observed during performance of test demonstrations on approved data forms at the time of demonstration and when the results are observed.
5. Provide full access to Owner's witness to directly observe the performance of all aspects of system response during the test demonstration. On completion of a test demonstration, sign the completed data form and obtain signature of Owner's witness at the time of the test to authenticate the reported results.
6. Test demonstration data forms not signed by Contractor and Owner's witness at the time of the completion of the procedure will be rejected. Test demonstrations for which data forms are rejected shall be repeated and results shall be resubmitted.

    a. Exception for Failure of Owner's Witness to Attend: Failure of Owner's witness to be present for agreed-on schedule of test demonstration shall not delay Contractor. If Owner's witness fails to attend a scheduled test, Contractor shall proceed with the scheduled test. On completion, Contractor shall sign the data form for Contractor and for Owner's witness, and shall note the absence of Owner's witness at the scheduled time and place.

7. False load test requirements are specified in related sections.

    a. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply the specified load to the system. False load system shall be capable of steady-state operation and modulation at the level of load specified. Equipment and systems permanently installed in this work shall not be used to create the false load without Architect's written approval.

I. Deferred Tests:

1. Deferred Test List: Identify, in the request for Certificate of Construction-Phase Commissioning Process Completion, proposed deferred tests or other tests approved for deferral until specified seasonal or other conditions are available. When approved, deferred tests may be completed after the date of Construction-Phase Commissioning Completion. Identify proposed deferred tests in the request for Certificate of Construction-Phase Commissioning Process Completion as follows:

    a. Identify deferred tests by number and title.
    b. Provide a target schedule for completion of deferred tests.

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2. Schedule and coordinate deferred tests. Schedule deferred tests when specified conditions are available. Notify Architect and Commissioning Authority at least three working days (minimum) in advance of tests.
3. Where deferred tests are specified, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule deferred tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

J. Delayed Tests:

1. Delayed Test List: Identify, in the request for Certificate of Construction-Phase Commissioning Process Completion, proposed delayed tests. Obtain Owner approval of proposed delayed tests, including proposed schedule of completion of each delayed test, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. Include the following in the request for Certificate of Construction-Phase Commissioning Process Completion:

    a. Identify delayed tests by test number and title.
    b. Written approval of proposed delayed tests, including approved schedule of completion of delayed tests.

2. Schedule and coordinate delayed tests. Schedule delayed tests when conditions that caused the delay have been rectified. Notify Architect and Commissioning Authority at least three working days (minimum) in advance of tests.
3. Where delayed tests are approved, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule delayed tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

K. Commissioning Compliance Issues:

1. Test results that are not within the range of acceptable results are commissioning compliance issues.
2. Track and report commissioning compliance issues until resolution and retesting are successfully completed.
3. If a test demonstration fails, determine the cause of failure. Direct timely resolution of issue and then repeat the demonstration. If a test demonstration must be repeated due to failure caused by Contractor work or materials, reimburse Owner for billed costs for the participation in the repeated demonstration.
4. Test Results: If a test demonstration fails to meet the acceptance criteria, perform the following:

    a. Complete a commissioning compliance issue report form promptly on discovery of test results that do not comply with acceptance criteria.
    b. Submit commissioning compliance issue report form within 24 hours of the test.
    c. Determine the cause of the failure.
    d. Establish responsibility for corrective action if the failure is due to conditions found to be Contractor's responsibility.

5. Commissioning Compliance Issue Report: Provide a commissioning compliance issue report for each issue. Do not report multiple issues on the same commissioning compliance issue report.

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a. Exception: If an entire class of devices is determined to exhibit the identical issue, they may be reported on a single commissioning compliance issue report. (For example, if all return-air damper actuators that are specified to fail to the open position are found to fail to the closed position, they may be reported on a single commissioning issue report. If a single commissioning issue report is used for multiple commissioning compliance issues, each device shall be identified in the report, and the total number of devices at issue shall be identified.
b. Complete and submit Part 1 of the commissioning compliance issue report immediately when the condition is observed.
c. Record the commissioning compliance issue report number and describe the deficient condition on the data form.
d. Resolve commissioning compliance issues promptly. Complete and submit Part 2 of the commissioning compliance issue report when issues are resolved.

6. Diagnose and correct failed test demonstrations as follows:

a. Perform diagnostic tests and activities required to determine the fundamental cause of issues observed.
b. Record each step of the diagnostic procedure prior to performing the procedure. Update written procedure as changes become necessary.
c. Record the results of each step of the diagnostic procedure.
d. Record the conclusion of the diagnostic procedure on the fundamental cause of the issue.
e. Determine and record corrective measures.
f. Include diagnosis of fundamental cause of issues in commissioning compliance issue report.

7. Retest:

a. Schedule and repeat the complete test procedure for each test demonstration for which acceptable results are not achieved. Obtain signature of Owner's witness on retest data forms. Repeat test demonstration until acceptable results are achieved. Except for issues that are determined to result from design errors or omissions, or other conditions beyond Contractor's responsibility, compensate Owner for direct costs incurred as the result of repeated test demonstrations to achieve acceptable results.
b. For each repeated test demonstration, submit a new test data form, marked "Retest."

8. Do not correct commissioning compliance issues during test demonstrations.

a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than five minutes. If corrections are made under this exception, note the deficient conditions on the test data form and issue a commissioning compliance issue report. A new test data form, marked "Retest," shall be initiated after the resolution has been completed.

3.6 COMMISSIONING MEETINGS

A. Commissioning Authority will schedule and conduct commissioning meetings. Comply with requirements in Division 01 Section "Project Management and Coordination."

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3.7 SEQUENCING

A. Sequencing of Commissioning Verification Activities: For a particular material, item of equipment, assembly, or system, perform the following in the order listed unless otherwise indicated:

1. Construction Checklists:

    a. Material checks.
    b. Installation checks.
    c. Startup, as appropriate. Some startup may depend on component performance. Such startup may follow component performance tests on which the startup depends.
    d. Performance Tests:

        1) Static tests, as appropriate.
        2) Component performance tests. Some component performance tests may depend on completion of startup. Such component performance tests may follow startup.
        3) Equipment and assembly performance tests.
        4) System performance tests.
        5) Intersystem performance tests.

2. Commissioning tests.

B. Before performing commissioning tests, verify that materials, equipment, assemblies, and systems are delivered, installed, started, and adjusted to perform according to construction checklists.

C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing test demonstrations. Notify Architect if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.

D. Commence tests as soon as installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided the incomplete work does not interfere with successful execution of test.

3.8 SCHEDULING

A. Commence commissioning process as early in the construction period as possible.

B. Commissioning Schedule: Integrate commissioning activities into Construction Schedule. See Division 01 Section "Construction Progress Documentation."

1. Include detailed commissioning activities in monthly updated Construction Schedule and short-interval schedule submittals.
2. Schedule the start date and duration for the following commissioning activities:

    a. Submittals.
    b. Preliminary operation and maintenance manual submittals.
    c. Installation checks.
    d. Startup, where required.
    e. Performance tests.

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f. Performance test demonstrations.
g. Commissioning tests.
h. Commissioning test demonstrations.

3. Schedule shall include a line item for each installation check, startup, and test activity specific to the equipment or systems involved.
4. Determine milestones and prerequisites for commissioning process. Show commissioning milestones, prerequisites, and dependencies in monthly updated critical-path-method construction schedule and short-interval schedule submittals.

C. Two-Week Look-Ahead Commissioning Schedule:

1. Two weeks prior to the beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for the duration of commissioning process.
2. Two-week look-ahead schedules shall identify the date, time, beginning location, Contractor personnel required, and anticipated duration for each startup or test activity.
3. Use two-week look-ahead schedules to notify and coordinate participation of Owner's witnesses.

D. Owner's Witness Coordination:

1. Coordinate Owner's witness participation via Architect.
2. Notify Architect of commissioning schedule changes at least two work days in advance for activities requiring the participation of Owner's witness.

3.9 COMMISSIONING REPORTS

A. Test Reports:

1. Pre-startup reports include observations of the conditions of installation, organized into the following sections:

a. Equipment Model Verification: Compare contract requirements, approved submittals, and provided equipment. Note inconsistencies.
b. Preinstallation Physical Condition Checks: Observe physical condition of equipment prior to installation. Note conditions including, but not limited to, physical damage, corrosion, water damage, or other contamination or dirt.
c. Preinstallation Component Verification Checks: Verify components supplied with the equipment, preinstalled or field installed, are correctly installed and functional. Verify external components required for proper operation of equipment correctly installed and functional. Note missing, improperly configured, improperly installed, or nonfunctional components.
d. Summary of Installation Compliance Issues and Corrective Actions: Identify installation compliance issues and the corrective actions for each. Verify that issues noted have been corrected.
e. Evaluation of System Readiness for Startup: For each item of equipment for each system for which startup is anticipated, document in summary form acceptable to Owner completion of equipment model verification, preinstallation physical condition checks, preinstallation component verification checks, and completion of corrective actions for installation compliance issues.

2. Test data reports include the following:

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a. "As-tested" system configuration. Complete record of conditions under which the test was performed, including, but not limited to, the status of equipment, systems, and assemblies; temporary adjustments and settings; and ambient conditions.
b. Data and observations, including, but not limited to, data trend logs, recorded during the tests.
c. Signatures of individuals performing and witnessing tests.
d. Data trend logs accumulated overnight from the previous day of testing.

3. Commissioning Compliance Issue Reports: Report as commissioning compliance issues results of tests and test demonstrations that do not comply with acceptance criteria. Report only one issue per commissioning compliance issue report. Use sequentially numbered facsimiles of commissioning compliance issue report form included in this Section, or other form approved by Owner. Distribute commissioning compliance issue reports to parties responsible for taking corrective action. Identify the following:

a. Commissioning compliance issue report number. Assign unique, sequential numbers to individual commissioning compliance issue reports when they are created, to be used for tracking.
b. Action distribution list.
c. Report date.
d. Test number and description.
e. Equipment identification and location.
f. Briefly describe observations about the performance associated with failure to achieve acceptable results. Identify the cause of failure if apparent.
g. Diagnostic procedure or plan to determine the cause (include in initial submittal)
h. Diagnosis of fundamental cause of issues as specified below (include in resubmittal).
i. Fundamental cause of unacceptable performance as determined by diagnostic tests and activities.
j. When issues have been resolved, update and resubmit the commissioning issue report forms by completing Part 2. Identify resolution taken and the dates and initials of the persons making the entries.
k. Schedule for retesting.

4. Weekly progress reports include information for tests conducted since the preceding report and the following:

a. Completed data forms.
b. Equipment or system tested, including test number, system or equipment tag number and location, and notation about the apparent acceptability of results.
c. Activities scheduled but not conducted per schedule.
d. Commissioning compliance issue report log.
e. Schedule changes for remaining Commissioning-Process Work, if any.

5. Data trend logs shall be initiated and running prior to the time scheduled for the test demonstration.

a. Trend log data format shall be multiple data series graphs. Where multiple data series are trend logged concurrently, present the data on a common horizontal time axis. Individual data series may be presented on a segmented vertical axis to avoid interference of one data series with another, and to accommodate different axis scale values. Graphs shall be sufficiently clear to interpret data within the accuracy required by the acceptance criteria.
b. Attach to the data form printed trend log data collected during the test or test demonstration.

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c. Record, print out, and attach to the data form operator activity during the time the trend log is running. During the time the trend log is running, operator intervention not directed by the test procedure invalidates the test results.

6. System Alarm Logs: Record and print out a log of alarms that occurred since the last log was printed. Evaluate alarms to determine if the previous day's work resulted in any conditions that are not considered "normal operation."

   a. Conditions that are not considered "normal operation" shall be reported on a commissioning issue report attached to the alarm log. Resolve as necessary. The intent of this requirement is to discover control system points or sequences left in manual or disabled conditions, equipment left disconnected, set points left with abnormal values, or similar conditions that may have resulted from failure to fully restore systems to normal, automatic control after test completion.

3.10 CERTIFICATE OF CONSTRUCTION-PHASE COMMISSIONING PROCESS COMPLETION

A. When Contractor considers that construction-phase commissioning process, or a portion thereof which Owner agrees to accept separately, is complete, Contractor shall prepare and submit to Owner and Commissioning Authority through Architect a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter Contractor's responsibility to compete commissioning process.

B. On receipt of Contractor's list, Commissioning Authority will make an inspection to determine whether the construction-phase commissioning process or designated portion thereof is complete. If Commissioning Authority's inspection discloses items, whether included on Contractor's list, which is not sufficiently complete as defined in "Construction-Phase Commissioning Process Completion" Paragraph in the "Definitions" Article, Contractor shall, before issuance of the Certificate of Construction-Phase Commissioning Process Completion, complete or correct such items on notification by Commissioning Authority. In such case, Contractor shall then submit a request for another inspection by Commissioning Authority to determine construction-phase commissioning process completion.

C. Contractor shall promptly correct deficient conditions and issues discovered during commissioning process. Costs of correcting such deficient conditions and issues, including additional testing and inspections, the cost of uncovering and replacement, and compensation for Architect's and Commissioning Authority's services and expenses made necessary thereby, shall be at Contractor's expense.

D. When construction-phase commissioning process or designated portion is complete, Commissioning Authority will prepare a Certificate of Construction-Phase Commissioning Process Completion that shall establish the date of completion of construction-phase commissioning process. Certificate of Construction-Phase Commissioning Process Completion shall be submitted prior to requesting inspection for determining date of Substantial Completion.

END OF SECTION 019113

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SECTION 019119 - EXTERIOR ENCLOSURE COMMISSIONING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Building enclosure Cx process requirements for the above- and below-grade systems and assemblies:

a. Horizontal and vertical waterproofing.
b. Opaque walls.
c. Roofs.
d. Openings.
e. Interfaces.

C. Related Requirements:

1. Division 01 Section "General Commissioning Requirements" for general requirements for Cx processes including definitions, Cx team membership, Owner's responsibilities, Contractor's responsibilities, and CxA's responsibilities.

1.2 DEFINITIONS

A. Building Enclosure: Materials, components, systems, and assemblies intended to provide shelter and environmental separation between interior and exterior, or between two or more environmentally distinct interior spaces in a building or structure. The building enclosure includes, but is not limited to, exterior walls, above and below grade, and roof assemblies.

B. Cx: Commissioning, as defined in Division 01 Section "General Commissioning Requirements."

C. CxA: Commissioning Authority, as defined in Division 01 Section "General Commissioning Requirements."

D. First-Installation Mockups: Initial installation of specific enclosure materials, components, systems, and assemblies that are part of Work.

E. Integrated Exterior Mockups: Integrated mockups of the exterior enclosure erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

F. Laboratory Mockups: Full-size physical assemblies constructed at testing facility.

G. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.

H. Water Penetration: Visible evidence of uncontrolled water penetration on or adjacent to the test specimen in a location not intended to collect and drain water to the building exterior.

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1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Construction Checklists: Draft Construction Checklists will be created by CxA for Contractor review.

C. Construction Checklists: Include the following and comply with requirements in Section 019113 "General Commissioning Requirements" for Construction Checklists:

D. Cx Process Submittals:

1. Shop Drawings: For mockups, including elevations, plans, sections, and full-size details. Show interface conditions, interconnections, and terminations.
2. Testing Program: Developed specifically for Project.
3. Test Reports: Prepared by a qualified testing agency for each test.
4. Record Drawings: As-built drawings of mockups showing changes made during testing.

E. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For building envelope systems and components to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

B. Build mockups to evaluate constructability and performance and demonstrate the coordination of trades and sequencing of work necessary to ensure functional and integrated performance of materials, components, systems, assemblies, and interfaces.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Notify Architect and CxA seven days in advance of the dates and times when mockups will be constructed and tested.

C. Laboratory Mockups: Build at testing agency facility; use personnel, products, and methods of construction that will be used at Project site.

D. Integrated Exterior Mockups: Build at Project site on site at locations indicated on Drawings.

E. First Installation Mockups: Prepare each major exterior enclosure system for testing when first installed and before proceeding with construction of additional similar assemblies. If in compliance, Work may remain as part of the completed construction.

1. Wall Mockups: Extend one full structural bay wide by one full story high plus additional height to connect to assemblies below and above. Include a typical wall to interior floor slab connections.

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a. Minimum Size: 100 sq. ft. (9 sq. m).

2. Roof Mockups: Include parapet or roof edge conditions, flashings, and typical pipe, dunnage, and similar penetrations.

a. Minimum Size: 100 sq. ft. (9 sq. m).

3. Horizontal Below-Grade Waterproofing and Slab-on-Grade Mockups: Include edge conditions and typical penetrations.

a. Minimum Size: 100 sq. ft. (9 sq. m).

4. Vertical Below-Grade Waterproofing Mockups: Include edge, termination, and penetrations.
5. Building Expansion Joint Mockups: Include starting point at foundation and extend up vertical surfaces, across horizontal waterproofed surfaces and roofs and return to foundation. Include each type of corner, intersection, transition, and termination.

F. Mockups specified for quality assurance and control in the following sections may be combined with Cx mockups for testing purposes.

1. Division 03 Section "Precast Architectural Concrete."
2. Division 04 Section "Unit Masonry."
3. Division 04 Section "Exterior Stone Cladding."
4. Division Section 072726 "Fluid-Applied Membrane Air Barriers."
5. Section 076100 "Sheet Metal Roofing."
6. Section 084413 "Glazed Aluminum Curtain Walls."

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONSTRUCTION CHECKLISTS

A. Prepare detailed Construction Checklists for exterior enclosure Cx systems, subsystems, equipment, and components. Complete and submit Construction Checklists.

3.2 CONSTRUCTION CHECKLIST REVIEW

A. Review and provide written comments on draft Construction Checklists. CxA will create required draft Construction Checklists and provide them to Contractor.

B. Return draft Construction Checklist review comments within 10 days of receipt.

C. When review comments have been resolved, CxA will provide final Construction Checklists, marked "Approved for Use, (date)."

D. Use only Construction Checklists, marked "Approved for Use, (date)."

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3.3 GENERAL TESTING REQUIREMENTS

A. If tests cannot be completed because of a deficiency outside the scope of the building enclosure systems, document the deficiency and report it to Owner. After deficiencies are resolved, reschedule tests.

B. If seasonal testing is specified, complete appropriate initial performance tests and documentation and schedule seasonal tests.

C. Coordinate schedule with and perform Cx activities at the direction of the CxA.

3.4 LABORATORY MOCKUP TESTING

A. Laboratory Mockup Testing Service: Owner will engage a qualified testing agency to perform testing on laboratory mockups.

3.5 INTEGRATED EXTERIOR MOCKUP TESTING

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

3.6 FIRST-INSTALLATION MOCKUP TESTING

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

3.7 BUILDING ENCLOSURE TESTING

A. Building Enclosure Testing: Perform testing before installation of interior finishes unless otherwise indicated.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

END OF SECTION 019119

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SECTION 034500 - PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Architectural precast concrete cladding units.
2. Performance criteria, materials, production, and erection of precast architectural concrete units.
3. Labor, material, equipment, related services, and supervision required for the manufacture and erection of the precast architectural concrete units.

C. Related Requirements:

1. Division 03 "Cast-in-Place Concrete" for installing connection anchors in concrete.
2. Division 05 Section "Structural Steel Framing" for furnishing and installing connections attached to structural-steel framing.
3. Division 05 Section "Metal Fabrications" for kickers and other miscellaneous steel shapes.
4. Division 07 Section “Sheet Metal Flashing and Trim” for sheet metal flashing and trim.
5. Division 07 Section “Joint Sealants” for joint sealants.

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code**.**

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1.3 DEFINITIONS

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

1.4 REFERENCE STANDARDS

A. Applicable Specifications, Standards, and Codes: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following specifications, standards, and codes. This specification governs in case of conflicting requirements.

1. Design Standards: Comply with ACI 318 (ACI 318M) and the design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete."
2. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations and inspection procedures, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
3. Welding Standards: Comply with the following American Welding Society (AWS) standards:

    a. A5.1 "Specifications for Carbon Steel Electrodes for Shielded Metal Arc Welding."
    b. A5.18 "Specifications for Carbon Steel Filler Metals for Gas Shielded Arc Welding."
    c. D1.1 "Structural Welding Code - Steel."
    d. D1.4 "Structural Welding Code - Reinforcing Steel."

4. Bolts Standard: American Institute of Steel Construction (AISC): "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
5. American Welding Society (AWS):

    a. AWS D1.1 "Structural Welding Code, Steel."
    b. AWS D1.4 "Structural Welding Code, Reinforcing Steel."

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

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

B. Product Data: For each type of product indicated. Retain quality control records and certificates of compliance for 5 years after completion of structure.

1. Precast architectural concrete unit design mixtures: Include compressive strength and water-absorption tests for each precast concrete mixture.
2. Reinforcing materials.
3. Concrete materials.
4. Connection materials.
5. Accessories.
6. Grout materials.

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C. Shop Drawings:

1. Detail fabrication and installation of architectural precast concrete units.
2. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit.
3. Indicate aesthetic intent including joints, reveals, drips, chamfers, and extent and location of each surface finish.
4. Indicate details at building corners.
5. Indicate separate face and backup mixture locations and thicknesses.
6. Indicate type, size, and length of welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
7. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
8. Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
9. Include plans and elevations showing unit location and sequence of erection sequences, and bracing plans for special conditions.
10. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
11. Indicate relationship of architectural precast concrete units to adjacent materials.
12. Indicate locations, type, dimensions, and details of facing units, including corner units, special shapes, joint treatment and anchors.
13. Reinforcement, joint and connection details. Indicate method of field adjustment for all proposed connections.
14. Lifting and erection inserts.
15. Other items cast into panels.
16. Handling procedures, plans and elevations showing panel location and sequence of erection.
17. Loads: Show the location, type, magnitude and direction of all loads from the precast architectural concrete units to the building structural frame. The shop drawings shall show each unit and each location.
18. If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

D. Samples: Design reference samples for initial verification of design intent, for each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of three, representative of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches (300 by 300 by 50 mm).

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.

E. Fabrication Engineering and Design: For architectural precast concrete indicated to comply with performance requirements, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include calculations supporting engineering design decisions.
2. Show types, connections, types of reinforcement, types of assembly stiffeners, and other aspects of structural engineering. Indicate location, type, magnitude, and direction of loads imposed on the building structural.

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1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer fabricator testing agency.

B. Welding certificates.

C. Material Certificates: For the following items:

1. Aggregates.
2. Cementitious materials.
3. Reinforcing materials and prestressing tendons.
4. Admixtures.
5. Bearing pads.
6. Structural-steel shapes and hollow structural sections.
7. Water-absorption test reports.
8. Insulation.

D. Material Test Reports: For aggregates.

E. Preconstruction test reports.

F. Source quality-control test reports.

G. Field quality-control and special inspection reports.

1.8 QUALITY ASSURANCE

A. Subcontractor Qualifications: Subcontract the precast architectural concrete work to an precast architectural concrete subcontractor who has a minimum of 10 years successful experience performing custom fabrication and erection of precast architectural concrete work comparable to that shown and specified, in not less than three projects of similar scope to the satisfaction of the Architect, and maintains an organized quality control and testing program, and who retains facilities with sufficient capacity and quality to produce the required units without causing delay to the project.

1. 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 and who can produce an Erectors' Post-Audit Declaration.
2. 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.

    a. Designated as a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units or designated as an APA-certified plant for production of architectural precast concrete products.

B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

C. Owner Testing: The Owner will engage an Independent Testing and Inspection Agency to verify the adequacy of the precast architectural concrete quality control. The Testing Agency shall perform tests and inspections of the precast architectural concrete work, interpret them,

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evaluate the results for compliance with the specifications, and report the findings to the Architect and the Contractor.

D. Precast Architectural Concrete Contractor Testing: The precast architectural concrete Contractor shall engage at its own expense a Technical Agency, or ACI certified testing and inspection personnel, which shall be other than that retained by the Owner for the purpose of designing the precast concrete panel mixes, determining the suitability of materials to be used in the work, and to provide precast architectural concrete production quality control. The extent of precast architectural concrete contractor testing is specified under Article "Source Quality Control." The precast architectural concrete contractor shall furnish all materials samples, shop drawings, and access to materials as required for testing and any casual labor and facility required by the Contract to aid in its quality control verification testing and inspection.

E. Owner Testing: The Owner will engage an Independent Testing and Inspection Agency to verify the adequacy of the precast architectural concrete quality control. The Testing Agency shall perform tests and inspections of the precast architectural concrete work, interpret them, evaluate the results for compliance with the specifications, and report the findings to the Architect and the Contractor.

F. Precast Architectural Concrete Contractor Testing: The precast architectural concrete Contractor shall engage at its own expense a Technical Agency, or ACI certified testing and inspection personnel, which shall be other than that retained by the Owner for the purpose of designing the precast concrete panel mixes, determining the suitability of materials to be used in the work, and to provide precast architectural concrete production quality control. The extent of precast architectural concrete contractor testing is specified under Article "Source Quality Control." The precast architectural concrete contractor shall furnish all materials samples, shop drawings, and access to materials as required for testing and any casual labor and facility required by the Contract to aid in its quality control verification testing and inspection.

G. 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."

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

1.9 SAMPLE PANELS AND MOCKUPS

A. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of two sample panels approximately 16 sq. ft. (1.5 sq. m) 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.

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B. Mockups: After sample 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 to set quality standards for materials and execution.

1. Build mockup as indicated on Drawings including aluminum framing, glass, sealants, 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 contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

C. Preconstruction Testing Mockup: Provide a full-size mockup of architectural precast concrete indicated on Drawings for preconstruction testing. See Section 014000 Quality Requirements "" for preconstruction testing requirements.

1. Build preconstruction testing mockup as indicated on Drawings including aluminum framing, glass, sealants, and architectural precast concrete complete with anchors, connections, flashings, and joint fillers.
2. Build preconstruction testing mockup at testing agency facility.

1.10 COORDINATION

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.

1.11 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 or other rehandling.

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 manner that avoids excessive stresses that cause cracking or damage.

F. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General: Precast architectural concrete panel engineering, including support and connection to building structural framing, shall be performed and sealed by a licensed professional engineer registered in the State of Florida.

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1. Where loading from precast panels transmits forces to the building structural frame which exceed the capacity of the frame to resist such forces, the precast architectural concrete Contractor shall engineer, provide, and install all supplemental steel supports and bracing required to stiffen the frame.

B. Connection Systems: The connection systems, where indicated, are suggested for the precast installation. The final design of all connection systems shall be the sole responsibility of the precast architectural concrete Contractor and thereafter the Contractor for acceptance and inclusion into the Project.

1. The structure is designed to carry no more than one floor of precast concrete at each level. Two story precast concrete panels will not be allowed except where specifically noted. Precast concrete panels shall be designed where possible to connect to columns or to the concrete slab edge in close vicinity to the column.
2. Precast concrete panels shall have a minimum of two gravity connections. Where more than two gravity connections are provided, the Contractor shall assess the portion of gravity load assigned to each gravity connection considering precast concrete and structure deformations and stiffness. Gravity connections shall be designed to have lateral relief to allow for thermal movements in the plane of the precast concrete panel. Gravity connections may also act as lateral connections.
3. Except where a gravity connection is also a lateral connection, lateral connections shall not carry gravity loads. Lateral connections shall be designed to provide lateral relief to allow for thermal movements in the plane of the precast concrete panel.
4. In general, connections shall not offer restraint to loads and deformations except for which specifically designed.
5. Provide all miscellaneous steel framing which serves to extend, align, and stiffen the building structural framing to accommodate precast concrete panel eccentricities and imposed torsion to the building structural frame inclusive of beam and column outriggers and spandrel beam bracing to resist torsion.

    a. Kickers, or knee braces, which pierce the exterior wall flashing assemblies will not be permitted.

2.2 PERFORMANCE REQUIREMENTS

A. Fabrication Engineering and Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements. Provide a comprehensive engineering analysis based on performance requirements and design criteria indicated.

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

C. Calculated Fire-Test-Response Characteristics: Provide architectural precast concrete units with fire-resistance rating indicated as calculated according to ACI 216.1, PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete," and acceptable to authorities having jurisdiction.

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

1. Dead Loads: Panel dead loads plus dead loads superimposed on the panels.

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2. Wind Loads: Design, fabricate, and install precast architectural concrete units to withstand the maximum inward and outward wind pressures required by the Florida Building Code based on design criteria indicated on Drawings.
3. Design precast concrete units and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements as follows:

    a. Upward and downward movement of 1 inch (unrelated to erection tolerances), unless otherwise indicated on Drawings.
    b. Lateral movement of 3/8 inch for inter-story drifts at joints and connection points (unrelated to erection tolerances.)

4. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of up to 120 deg F (67 deg C).
5. Window Washing System: Design precast units to withstand the loads caused by window washing equipment.
6. Concrete Tension Stresses: The concrete tension stresses at working design loads shall not exceed the following:

    a. At Exterior Face of Element: 4.5 times the square root of f'c.
    b. At Interior Face of Element: 7.5 times the square root of f'c.

7. Deflections: Base the calculations for deflections upon all loads superimposed on the panels, including walls and other adjacent materials if applicable, building structural frame movements, erection tolerances, thermal stresses, and the following.

    a. Design, fabricate, and install assemblies, including anchorage, for deflections not to exceed 1/1000 times span parallel to wall at full design loading. Span is defined as the distance between anchor centerlines; for cantilevers, span is defined as the distance between anchor centerline and the end of the cantilever.
    b. Design, fabricate, and install assemblies, including anchorage, for deflections not to exceed 1/500 times span perpendicular to the wall at full design loading. Span is defined as the distance between anchor centerlines; for cantilevers, span is defined as the distance between anchor centerline and the end of the cantilever.

8. Building Movement: Design, fabricate, and install precast architectural concrete panels to withstand building movements including thermal movements, loading deflections, shrinkage, creep and similar movements. Thermal movements shall be as specified herein. Building frame deflections, shrinkage, creep and other movements are available from the structural engineer.
9. Safety Factor for Inserts and Embedments: The minimum factor of safety for any inserts cast into the precast architectural concrete panels shall be 2.5. Embedments cast into the precast architectural concrete panels shall comply with ACI 318 and the Florida Building Code.
10. Leakage of Air and Water: Design, fabricate, and install all precast architectural concrete work, including joints between precast and metals, to effectively prevent leakage of either water or air into the building, under any combination of the foregoing performance requirements when any type or amount of precipitation occurs. Leakage of water is defined as the appearance of uncontrolled water, through any portion of the precast assembly including all sealed joints to the interior plane of precast work. Leakage of air is defined as air infiltration at a rate exceeding 0.06 cfm per square foot per panel assembly per bay of precast assemblies including piece to piece and assembly to assembly joints when tested in accordance with ASTM E283 at a static air pressure difference of 6.25 psf.

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11. Exterior Maintenance Loads: The precast architectural concrete units shall be designed, fabricated, and installed to withstand the loads caused by exterior maintenance equipment.

2.3 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides 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 form-release agent that does not bond with, stain or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

B. Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.

2.4 REINFORCING MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A615/A615M, grade as selected by fabricator, deformed.

C. Low-Alloy-Steel Reinforcing Bars: ASTM A706/A706M, grade as selected by fabricator, deformed.

D. Galvanized Reinforcing Bars: ASTM A615/A615M or ASTM A706/A706M, grade as selected by fabricator, deformed bars, with ASTM A767/A767M, Class II zinc coating and chromate treatment. Galvanize after fabrication and bending.

E. Epoxy-Coated Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420) ASTM A706/A706M, deformed bars, ASTM A775/A775M or ASTM A934/A934M epoxy coated.

F. Plain-Steel Welded Wire Reinforcement: ASTM A185/A185M, fabricated from galvanized-steel wire into flat sheets.

G. Epoxy-Coated-Steel Wire: ASTM A884/A884M, Class A coated, plain or deformed, flat sheet, Type 1 bendable or Type 2 nonbendable coating.

H. 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 and only when used if they are not visible in the finished face.

2.5 PRESTRESSING TENDONS

A. Prestressing Strand: ASTM A 416/A 416M, Grade 270 (Grade 1860), uncoated, seven-wire, low-relaxation strand.

1. Coat unbonded post-tensioning strand with post-tensioning coating complying with ACI 423.7 and sheath with polypropylene tendon sheathing complying with ACI 423.7. Include anchorage devices and coupler assemblies.

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2.6 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or Type III, gray, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.

B. Supplementary Cementitious Materials:

1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
2. Metakaolin: ASTM C 618, Class N.
3. Silica Fume: ASTM C 1240, with optional chemical and physical requirement.
4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
5. Blended Hydraulic Cement: ASTM C 595, Type IP, portland-pozzolan cement.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33/C 33M, 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: To match design reference sample.

2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate; to match approved finish sample.

D. Lightweight Aggregates: Except as modified by PCI MNL 117, ASTM C 330/C 330M, with absorption less than 11 percent.

E. Coloring Admixture: ASTM C 979/C 979M, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

F. 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.

G. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

H. 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. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
7. Plasticizing Admixture: ASTM C 1017/C 1017M, Type I.
8. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
9. Corrosion Inhibiting Admixture: ASTM C 1582/C 1582M.

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2.7 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 Type B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

C. Carbon-Steel Plate: ASTM A 283/A 283M, Grade C.

D. Malleable Iron Castings: ASTM A 47/A 47M, Grade 32510 or Grade 35028.

E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30 (Grade 415-205).

F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

G. Carbon-Steel Structural Tubing: ASTM A 500/A 500M, Grade B or Grade C.

H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65 (Grade 450).

I. Deformed-Steel Wire or Bar Anchors: ASTM A 496/A 496M or ASTM A 706/A 706M.

J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A or ASTM F 1554, Grade 36 (ASTM F 568M, Property Class 4.6); carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563 (ASTM A 563M); and flat, unhardened steel washers, ASTM F 844.

K. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563 (ASTM A 563M); and hardened carbon-steel washers, ASTM F 436 (ASTM F 436M).

L. 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-21035B or SSPC-Paint 20.

M. Welding Electrodes: Comply with AWS standards.

2.8 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 (15.5 MPa), 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;

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capable of supporting a compressive stress of 3000 psi (20.7 MPa) with no cracking, splitting, or delaminating in the internal portions of pad. Test one specimen for every 200 pads used in Project.

3. Frictionless Pads: PTFE, glass-fiber reinforced, bonded to stainless or mild-steel plate, or random-oriented-fiber-reinforced elastomeric pads; of type required for in-service stress.
4. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.9 ACCESSORIES

A. Precast Accessories: Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install architectural precast concrete units.

2.10 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

1. Use a single design mixture for units with more than one major face or edge exposed.
2. Where only one face of unit is exposed use either a single design mixture or separate mixtures for face and backup.

B. Limit use of fly ash and ground granulated blast-furnace slag to 20 percent of portland cement by weight; limit metakaolin and silica fume to 10 percent of portland cement by weight.

C. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

D. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 (ACI 318M) or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

E. Normal-Weight Concrete Mixtures: Proportion face and backup mixtures or full-depth mixtures, at fabricator's option 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 (34.5 MPa) minimum.
2. Maximum Water-Cementitious Materials Ratio: 0.45.

F. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to ASTM C 642, except for boiling requirement.

G. 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.

H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.11 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.

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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.

2.12 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. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.

D. Cast-in openings larger than 10 inches (250 mm) in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.

E. 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 reinforcing steel and prestressing strands to maintain at least 3/4-inch (19-mm) minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches (38 mm) when units are exposed to corrosive environment or severe exposure conditions. 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.
4. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

F. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses and specified in-place loads.

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G. Prestress tendons for architectural precast concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 117.

1. Delay de-tensioning or post-tensioning of precast, prestressed architectural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete unit.
2. De-tension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
3. If concrete has been heat cured, de-tension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.

H. 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.

I. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch (25 mm) or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.

J. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.

1. Place backup concrete mixture to ensure bond with face-mixture concrete.

K. 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 voids on surfaces. Use equipment and procedures complying with PCI MNL 117.

1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants." Ensure adequate bond between face and backup concrete, if used.

L. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

M. 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 does not show in finished structure.

N. 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.

O. 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.

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2.13 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

B. Fabricate architectural precast concrete units to shapes, lines, and dimensions indicated so each finished unit complies with the following product tolerances:

1. Overall Height and Width of Units, Measured at the Face Exposed to View: As follows:

    a. 10 feet (3 m) or under, plus or minus 1/8 inch (3 mm).
    b. 10 to 20 feet (3 to 6 m), plus 1/8 inch (3 mm), minus 3/16 inch (5 mm).
    c. 20 to 40 feet (6 to 12 m), plus or minus 1/4 inch (6 mm).
    d. Each additional 10 feet (3 m), plus or minus 1/16 inch (1.5 mm).

2. Overall Height and Width of Units, Measured at the Face Not Exposed to View: As follows:

    a. 10 feet (3 m) or under, plus or minus 1/4 inch (6 mm).
    b. 10 to 20 feet (3 to 6 m), plus 1/4 inch (6 mm), minus 3/8 inch (10 mm).
    c. 20 to 40 feet (6 to 12 m), plus or minus 3/8 inch (10 mm).
    d. Each additional 10 feet (3 m), plus or minus 1/8 inch (3 mm).

3. Total Thickness or Flange Thickness: Plus 1/4 inch (6 mm), minus 1/8 inch (3 mm).
4. Rib Thickness: Plus or minus 1/8 inch (3 mm).
5. Rib to Edge of Flange: Plus or minus 1/8 inch (3 mm).
6. Distance between Ribs: Plus or minus 1/8 inch (3 mm).
7. Variation from Square or Designated Skew (Difference in Length of the Two Diagonal Measurements): Plus or minus 1/8 inch/72 inches (3 mm/1830 mm) or 1/2 inch (13 mm) total, whichever is greater.
8. Length and Width of Block-outs and Openings within One Unit: Plus or minus 1/4 inch (6 mm).
9. Location and Dimension of Block-outs Hidden from View and Used for HVAC and Utility Penetrations: Plus or minus 3/4 inch (19 mm).
10. Dimensions of Haunches: Plus or minus 1/4 inch (6 mm).
11. Haunch Bearing Surface Deviation from Specified Plane: Plus or minus 1/8 inch (3 mm).
12. Difference in Relative Position of Adjacent Haunch Bearing Surfaces from Specified Relative Position: Plus or minus 1/4 inch (6 mm).
13. Bowing: Plus or minus L/360, maximum 1 inch (25 mm).
14. Local Smoothness: 1/4 inch/10 feet (6 mm/3 m).
15. Warping: 1/16 inch/12 inches (1.5 mm/300 mm) of distance from nearest adjacent corner.
16. Tipping and Flushness of Plates: Plus or minus 1/4 inch (6 mm).
17. Dimensions of Architectural Features and Rustications: Plus or minus 1/8 inch (3 mm).

C. Position Tolerances: For cast-in items measured from datum line location, as indicated on Shop Drawings.

1. Weld Plates: Plus or minus 1 inch (25 mm).
2. Inserts: Plus or minus 1/2 inch (13 mm).
3. Handling Devices: Plus or minus 3 inches (75 mm).
4. Reinforcing Steel and Welded Wire Reinforcement: Plus or minus 1/4 inch (6 mm) where position has structural implications or affects concrete cover; otherwise, plus or minus 1/2 inch (13 mm).

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5. Reinforcing Steel Extending out of Member: Plus or minus 1/2 inch (13 mm) of plan dimensions.
6. Tendons: Plus or minus 1/4 inch (6 mm), vertical; plus or minus 1 inch (25 mm), horizontal.
7. Location of Rustication Joints: Plus or minus 1/8 inch (3 mm).
8. Location of Opening within Panel: Plus or minus 1/4 inch (6 mm).
9. Location of Flashing Reglets: Plus or minus 1/4 inch (6 mm).
10. Location of Flashing Reglets at Edge of Panel: Plus or minus 1/8 inch (3 mm).
11. Reglets for Glazing Gaskets: Plus or minus 1/8 inch (3 mm).
12. Electrical Outlets, Hose Bibs: Plus or minus 1/2 inch (13 mm).
13. Location of Bearing Surface from End of Member: Plus or minus 1/4 inch (6 mm).
14. Allowable Rotation of Plate, Channel Inserts, and Electrical Boxes: 2-degree rotation or 1/4 inch (6 mm) maximum over the full dimension of unit.
15. Position of Sleeve: Plus or minus 1/2 inch (13 mm).
16. Location of Window Washer Track or Buttons: Plus or minus 1/8 inch (3 mm).

2.14 FINISHES

A. Exposed faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved sample panels and as follows:

1. Design Reference Sample: Match Architect’s Samples as prepared by Gate Precast Inc.

    a. PC-01 Color: Alabaster.
    b. PC-02 Color: Dorian Gray.

2. PCI's "Architectural Precast Concrete - Color and Texture Selection Guide," of plate numbers indicated.
3. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.

B. Finish exposed top surfaces of architectural precast concrete units to match face-surface finish.

C. Finish unexposed surfaces of architectural precast concrete units with as cast finish.

2.15 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, ASTM C 1610/C 1610M, ASTM C 1611/C 1611M, ASTM C 1621/C 1621M, and ASTM C 1712.

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 is considered deficient if units fail to comply with ACI 318 (ACI 318M) requirements for concrete strength.

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D. Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 (ACI 318M) 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 and ACI 318 (ACI 318M).

1. A minimum of three representative cores shall be taken from units of suspect strength, from locations directed by Architect.
2. Test cores in an air-dry condition.
3. Strength of concrete for each series of three cores is 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. Report test results in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports 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.

F. Defective Units: Discard and replace recast architectural concrete units that do not comply with acceptability requirements in PCI MNL 117, including concrete strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.

B. Do not install precast concrete units until supporting cast-in-place concrete has attained minimum allowable design compressive strength and supporting steel or other structure is structurally ready to receive loads from precast concrete units.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

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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 of units until permanent connections are completed.

1. Install temporary steel or plastic spacing shims as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
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 3/4 inch (19 mm).

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.

1. Do not permit connections to disrupt continuity of roof flashing.

D. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M 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- (0.1-mm-) thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780/A 780M.
4. Visually inspect welds and remove, reweld, or repair incomplete and defective welds.

E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
2. For slip-critical connections, use one of the following methods to assure proper bolt pretension:

    a. Turn-of-Nut: According to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
    b. Calibrated Wrench: According to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
    c. Twist-off Tension Control Bolt: ASTM F 1852.
    d. Direct-Tension Control Bolt: ASTM F 1852.

3. For slip-critical connections, use method and inspection procedure approved by Architect and coordinated with inspection agency.

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F. Grouting or Dry-Packing Connections and Joints: Grout connections where required or indicated. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens. Keep grouted joints damp for not less than 24 hours after initial set.

3.3 ERECTION TOLERANCES

A. Erect architectural precast concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

B. Erect architectural precast concrete units level, plumb, square, and in alignment, without exceeding the following noncumulative erection tolerances:

1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch (13 mm).
2. Plan Location from Centerline of Steel: Plus or minus 1/2 inch (13 mm).
3. Top Elevation from Nominal Top Elevation: As follows:

    a. Exposed Individual Panel: Plus or minus 1/4 inch (6 mm).
    b. Non-Exposed Individual Panel: Plus or minus 1/2 inch (13 mm).
    c. Exposed Panel Relative to Adjacent Panel: 1/4 inch (6 mm).
    d. Non-Exposed Panel Relative to Adjacent Panel: 1/2 inch (13 mm).

4. Support Elevation from Nominal Support Elevation: As follows:

    a. Maximum Low: 1/2 inch (13 mm).
    b. Maximum High: 1/4 inch (6 mm).

5. Maximum Plumb Variation over the Lesser of Height of Structure or 100 Feet (30 m): 1 inch (25 mm).
6. Plumb in Any 10 Feet (3 m) of Element Height: 1/4 inch (6 mm).
7. Maximum Jog in Alignment of Matching Edges: 1/4 inch (6 mm).
8. Joint Width (Governs over Joint Taper): Plus or minus 1/4 inch (6 mm).
9. Maximum Joint Taper: 3/8 inch (10 mm).
10. Joint Taper in 10 Feet (3 m): 1/4 inch (6 mm).
11. Maxim um Jog in Alignment of Matching Faces: 1/4 inch (6 mm).
12. Differential Bowing or Camber, as Erected, between Adjacent Members of Same Design: 1/4 inch (6 mm).
13. Opening Height between Spandrels: Plus or minus 1/4 inch (6 mm).

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections and prepare reports:

1. Erection of loadbearing precast concrete members.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

C. Visually inspect field welds and test according to ASTM E 165 or to ASTM E 709 and ASTM E 1444. High-strength bolted connections are subject to inspections.

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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, shall 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. 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 and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet (6 m).

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780/A 780M.

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. 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

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SECTION 035416 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Hydraulic cement based, polymer-modified, self-leveling, underlayment for application below interior floor coverings.

C. Related Requirements:

1. Division 09 Section "Moisture Vapor Emission Control" for moisture mitigation system.
2. Division 09 Section "Tiling" for compatible tile setting systems.

1.2 ALLOWANCES

A. Provide hydraulic cement underlayment as part of underlayment allowance.

1.3 UNIT PRICES

A. Work of this Section is affected by underlayment unit price.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

B. Organize meeting to review specification requirements and finished aesthetics. Require attendance by representatives of each affected entity, including the following:

1. Owner.
2. Architect.
3. Contractor's Superintendent/Supervisor.
4. Overlayment System & Polishing Subcontractor(s), including Finishers and Supervisor.
5. Complementary Hardeners, Sealers, Colorants Manufacturer(s).
6. Overlayment System Manufacturer’s Representative.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Hydraulic cement underlayment.
2. Reinforcement.
3. Primer.
4. Surface sealer.

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B. Sustainable Design Submittals:

1. Product Data: For adhesives, sealants and coatings onsite indicating VOC content.
2. Laboratory Test Reports: For adhesives, sealants and coatings onsite indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For resilient base and stair products and accessories onsite indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

D. Floor flatness: provide a survey of the existing flooring showing flatness and the required depths of underlayment to achieve required flatness using ASTM E1155 criteria. Measure depth of underlayment using ASTM C1708 as necessary to achieve a variation of not greater than 1/8 inch in 10 feet, or flatter as required by Division 09 finish materials or the Owner's equipment. .

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Environmental Product Declarations:

a. Submit product specific type III EPDs or Industry wide (generic) EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.
b. EPD Optimization: For materials, indicating embodied carbon/LCA optimization report or action plan.

2. Building Product Disclosure and Optimization - Material Ingredients:

a. Material Ingredient Optimization: Submit at least one of the following:

1) GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
2) Cradle to Cradle: Manufacturer's published literature for the product bearing the Cradle to Cradle logo, with gold or platinum certification.
3) International Alternative Compliance Path - REACH Optimization.
4) Declare: Manufacturer's completed Product Declaration Form.
5) Other programs approved by USGBC.

C. Test Reports:

1. For fire-resistant ratings, from a qualified testing agency.
2. For STC-rated assemblies, from a qualified testing agency.
3. For IIC-rated assemblies, from a qualified testing agency.
4. Flatness determined according to ASTM E1155.

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1.7 QUALITY ASSURANCE

A. Manufacturer Qualification: Employs factory trained personnel who are available for consultation and Project site inspection.

B. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

C. Product Compatibility: Manufacturers of underlayment and floor-covering systems certify in writing that products are compatible.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating directions for storage and mixing with other components.

B. Store moisture mitigation membrane products in a temperature controlled environment, protected from weather and at ambient temperature of not less than 65 degrees F, and not more than 85 def. F for at least 48 hours before use.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.

1. Place hydraulic cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 degrees F (10 and 27 degrees C).
2. Maintain ambient temperature and relative humidity in installation areas in range recommended by manufacturer for 48 hours before installation, during installation and 48 hours after installation, and where concrete surface temperatures remain a minimum of 5 degrees F. higher than dew point for ambient temperature, and relative humidity conditions during this period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Comply with ASTM E119; 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.

B. VOC Content: Wet-applied on site shall have VOC content in compliance with applicable VOC limits (g/L) for the following types of products:

1. Adhesives and Sealants
2. Paints and Coatings:

C. Emissions:

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1. Adhesives, sealants, paints, and coatings wet-applied on site shall comply the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. Hard surface flooring products shall be Floorscore certified or compliant with the VOC emissions testing criteria of CDPH Standard Method v1.2.

2.2 HYDRAULIC CEMENT UNDERLAYMENTS

A. Hydraulic Cement Underlayment: Polymer-modified, self-leveling, pumpable and pourable low alkali hydraulic cement product that can be applied in minimum uniform thickness of 1/4 inch (6 mm) and that can be feathered at edges to match adjacent floor elevations; and up to 1-1/2 inches.

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

    a. ARDEX Americas; “Ardex K 15.”
    b. Custom Building Products; “CustomTech TechLevel 150 Self-Leveling Underlayment.”
    c. Laticrete International, Inc.; “LATICRETE NXT LEVEL PLUS.”
    d. MAPEI Corporation; “Novoplan 2 Plus.”

2. Cement Binder: ASTM C150/C150M, Portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C219.
3. Compressive Strength: Not less than 4,000 psi (27.6 MPa) at 28 days when tested according to ASTM C109/C109M.
4. Flexural Strength: ASTM C348, 800 psi at 28 days.
5. VOC: 0 g/l.
6. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.

B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm); or coarse sand as recommended by underlayment manufacturer.

1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 degrees F (21 degrees C).

D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

1. VOC Content: Provide coating with VOC content of 100 g/L or less.

E. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.

F. Low-Emitting Materials:

1. Adhesives and coatings on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. Adhesives and coatings products on site must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4 BD+C."

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of the Work.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

   a. Anhydrous Calcium Chloride Test, ASTM F1869: Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/100 sq. m) in 24 hours.
   b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 85 percent relative humidity level measurement, or as recommended by hydraulic cement underlayment manufacturer.

C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 INSTALLATION

A. General: Mix and install underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment installation and for time period after installation recommended in writing by manufacturer.
2. Coordinate installation of components to provide optimum adhesion to substrate and between coats.
3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Install underlayment to produce uniform, level surface. Where underlayment exceeds 3/4 inch in thickness, use aggregate for strength. Where underlayment exceeds 1 inch, use additional reinforcing lath positioned a mid-point of pour to reinforce pour and minimize cracking.

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1. Install a final layer without aggregate to product surface.
2. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during installation and curing processes.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Apply surface sealer at rate recommended by manufacturer.

G. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 INSTALLATION TOLERANCES

A. Finish and measure surface, so gap at any point between gypsum cement underlayment surface and an unleveled, freestanding, 10-foot- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch (3 mm).

3.5 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 035416

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SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents

B. Section includes, but is not limited to:

1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry joint reinforcement.
5. Ties and anchors.
6. Miscellaneous masonry accessories.

C. Related Requirements:

1. Division 07 Section “Joint Sealants” for sealing control joints.
2. Division 07 Section “Penetration Firestopping” for firestopping at penetrations of fire-resistance-rated walls.
3. Division 07 Section “Joint Firestopping” for firestopping at top of fire-resistance-rated walls.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures for erecting masonry walls and partitions including, but not limited to, the following:

1. Wiring devices in unit masonry.
2. Doors and other items built-in to unit masonry.
3. Items supported by or within unit masonry.

1.4 ACTION SUBMITTALS

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

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

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1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For firms and persons specified in the "Quality Assurance' Article in this Section, to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified..

B. Material Certificates: For each type and size of the following:

1. Masonry units.

    a. Include data on material properties and material test reports substantiating compliance with requirements.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes will not be allowed. .
4. Grout mixes. Include description of type and proportions of ingredients.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

D. 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 TMS 602.

1.6 QUALITY ASSURANCE

A. Reference Standards: Work shall comply with requirements of local jurisdictions and the following reference standards, unless modified by the Contract Documents:

1. The Masonry Society: TMS 602.
2. National Concrete Masonry Association (NCMA): "TEK" Information Series":
3. American Society for Testing and Materials (ASTM): ASTM C1586 "Standard Guide for Quality Assurance of Mortars".

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.

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D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

E. Protect cavity 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.

1.8 FIELD CONDITIONS

A. 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 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.

B. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F (4 degrees C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. 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, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 MASONRY UNITS, GENERAL

A. Masonry Standard: Comply with TMS 620/ACI 530.1/ASCE 6 except as modified by more stringent requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

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C. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.3 CONCRETE MASONRY UNITS

A. Regional Materials: Manufacture CMUs within 100 miles (160 km) of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.

B. Recycled Content: Provide concrete masonry unit products with an average recycled content such that postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 20 percent.

C. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners, unless otherwise indicated.

D. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa) for an average of 3 units.
2. Density Classification:

    a. Interior Partitions: Medium weight; 105 to 125 lb/cu. ft. (1682 to 2002 kg/cu. m), except for interior structural load-bearing partitions.
    b. Fire Rated Assemblies: Light Weight, less than 105 lb/cu ft (1682 kg/cu. m)

        1) Aggregate: Expanded clay or shale or other material complying with ASTM C33 or UL 618.

3. Initial Rate of Absorption: 15 pounds per cubic foot for all interior concrete masonry.
4. Provide concrete masonry units with the following characteristics:

    a. Maximum linear shrinkage: 0.035 percent
    b. Maximum moisture content: 35 percent

5. Size: (Actual Dimensions): Width shown by 7-5/8 inches (194 mm) high by 15-5/8 inches (397 mm) long.
6. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.4 CONCRETE AND MASONRY LINTELS

A. General: Provide one of the following:

B. Concrete Lintels: ASTM C1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than CMUs.

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C. Precast or Formed-in-Place Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 032000 "Concrete Reinforcing," and with reinforcing 483 bars indicated.

D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs 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. Use bond beam blocks. Knock out block will not be accepted.

2.5 MORTAR AND GROUT MATERIALS

A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

B. Portland Cement: ASTM C150/C150M, 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 C207, Type S.

D. Mortar cement and masonry cements are not permitted.

E. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

F. Aggregate for Grout: ASTM C404.

G. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A615/A 615M or ASTM A996/A996M, Grade 60 (Grade 420).

B. Masonry Joint Reinforcement, General: ASTM A951/A951M.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Wire Size for Side Rods: 0.187-inch diameter.
3. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
5. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Unreinforced Single-Wythe Masonry: Truss type with single pair of side rods and diagonal crossrods.

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2.7 TIES AND ANCHORS

A. General: Ties and anchors extend at least 1-1/2 inches (38 mm) into masonry but with at least a 5/8-inch (16-mm) cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A 82M; with ASTM A153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A 1008M, Commercial Steel, with ASTM A153/A 153M, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A36/A 36M.

C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 01.05-inch- (2.66-mm-) thick, steel sheet, galvanized after fabrication.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.187-inch- (4.76-mm-)diameter, hot-dip galvanized steel wire.

D. Partition Lateral Support: Provide lateral support for partition tops using galvanized steel angles and plates of dimensions shown, spaced 4 ft. on center on both sides of the wall and secured to substrate above.

1. At fire rated partitions fill gap between top of wall and underside of structure above with mineral wool and seal with firestop spray seal as specified in Division 07 Section "Joint Firestopping."

E. Partition Top Anchors: Model PTA420, or Model PTA422 Partition Top Anchor by Homann and Barnard Inc.) 0.105-inch- (2.66-mm-) thick metal plate with 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) 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.

F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A 153M.

2.8 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch (0.86-mm), galvanized steel sheet.

C. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A307, Grade A (ASTM F568M, Property Class 4.6); with ASTM A563 (ASTM A563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A153/A 153M, Class C; of dimensions indicated.

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D. Postinstalled Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Load Capacity: Capable of sustaining, 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 E488, conducted by a qualified independent testing agency.
2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5 unless otherwise indicated.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 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 D226/D226M, Type I (No. 15 asphalt felt).

2.10 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: Subject to compliance with requirements, provide products by one of the following :

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.

2.11 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. Use portland cement-lime mortar unless otherwise indicated.
3. 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. Premix Mortars will not be permitted.

C. Mortar for Unit Masonry: Comply with ASTM C270, 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.

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1. For interior non-load-bearing partitions, Type O may be used instead of Type N.

D. Grout for Unit Masonry: Comply with ASTM C476.

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 TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C143/C 143M.

2.12 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 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 D226/D226M, Type I (No. 15 asphalt felt).

D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

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

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.

2.13 SOURCE QUALITY CONTROL

A. Engage a qualified independent testing agency to perform source quality-control testing indicated below:

1. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

B. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested for strength, absorption, and moisture content per ASTM C140.

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 the Work.

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1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that dovetail slots are properly placed in concrete.

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. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

C. 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.

D. 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.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
2. 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 (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. 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 (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.

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7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).

3.4 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 running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. 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 before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

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 CMUs with grout 24 inches (600 mm) 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. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch (13-mm) clearance between end of anchor rod and end of tube. Space anchors 48 inches (1200 mm) o.c. unless otherwise indicated.

I. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Joint Firestopping."

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J. Wall Marking and Identification: Concealed floor, floor-ceiling or attic space, fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions and any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling in the concealed space. Such identification shall:

1. Be located within 15 feet from end of wall and at intervals not exceeding 30 feet measured horizontally along the wall or partition.
2. Include lettering not less than 3 inches high with a minimum 3/8-inch stroke in a contrasting color incorporating the specific fire / smoke rating and the wording "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS".

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs 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.

1. For glazed masonry units, use a nonmetallic jointer 3/4 inch (19 mm) or more in width.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings 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.

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E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 1/2 inch (13 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.8 CONTROL JOINTS

A. General: Install control joints in unit masonry as masonry progresses and where indicated on the Drawings in accordance with requirements of NCMA TEK 10-02 or Engineer locations in accordance with NCMA TEK 10-03. Do not allow masonry materials to span control joints without provision to allow for in-plane wall or partition movement.

1. If not indicated, locate control joints at the lesser of the following:

    a. A distance of 25 feet (7.6 m) on center.
    b. A distance equal to 1-1/2 times the height of the wall.

2. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
3. In addition to the above requirements and unless otherwise indicated on the drawings, provide vertical control joints in masonry walls as follows:

    a. Within 10 feet (3 m) of wall corners and intersections,
    b. Adjacent to and over openings:

        1) On one side of openings less than 6’-0” (1.8 m) at end of lintel.
        2) On both sides of openings 6’-0” (1.8 m) wide and greater at both ends of lintel.

    c. Changes in wall height or wall thickness, such as at pipe and duct chases and pilasters.
    d. At movement construction joints in foundations, in roofs, and in floors.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

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3.9 LINTELS

A. Provide concrete or masonry lintels where shown and where openings of more than 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.10 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 loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602.

C. High Lift 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 TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

D. Low-Lift Grouting Method: Provide low lift grouting as the laying of masonry and placement of reinforcement progresses.

1. Place the first lift up to 16 inches (400 mm) height, but limit all subsequent pours to maximum 12 inches (300 mm) lifts, placed before masonry coursing is 24 inches (600 mm) higher than preceding pour. Allow setting mortar to cure at least 4 hours prior to grouting of cells in adjacent hollow masonry units.
2. Provide grout keys by terminating grout lifts a minimum of 1-1/2 inch (38 mm) below mortar joints or 1-1/2 inches (38 mm) above bed joint when one course is laid above horizontal reinforcing.
3. Consolidate each grout lift with a rod to provide uniform flow into all spaces of voids.
4. Place grout in cells up to top masonry course at a maximum 48 inches (600 mm) height above preceding pour.
5. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

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1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.12 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches (100 mm) in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.
4. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property as indicated in Division 01 Section “Construction Waste Management and Disposal.”

END OF SECTION 042000

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SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Miscellaneous steel framing and supports for the following:

    a. Countertops and shelving standards.
    b. Mechanical and electrical equipment.
    c. Applications where framing and supports are not specified in other Sections.
    d. Operable panel partitions.

2. Miscellaneous steel trim.
3. Loose bearing and leveling plates.
4. Transitions:

    a. Between inner water-proofing wall/curb and outer parapet wall (metal panel, or curtain wall).
    b. Applications intended to be covered with an outer, aesthetic coping products.

5. Metal ladders.
6. Metal gratings, not part of metal grating stairs.

C. 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.

D. Related Requirements:

1. Division 05 Section "Structural Steel Framing" for steel framing, supports, and other steel items attached to the structural-steel framing.
2. Division 05 Section "Metal Grating Stairs" for exterior grating stairs.
3. Division 05 Section "Pipe and Tube Railings."
4. Division 07 Section “Roof Accessories” for ladder specified with roof hatches.
5. Division 10 Section "Operable Partitions".

1.2 COORDINATION

A. Do not install enclosing or concealing construction until after welds have been inspected and tested and corrections have been made to defective applications.

B. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

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

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Paint products.
2. Shop primers.
3. Shrinkage-resisting grout.
4. Slotted channel framing.
5. Metal downspout boots.

B. Sustainable Design Submittals:

1. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Submit shop drawings detailing fabrication and installation details for each metal fabrication indicated; coordinated with shop drawings submitted by related trades. Include dimensioned plans, elevations, sections, and large-scale details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections. Provide Shop Drawings for the following:

1. Steel framing and supports for operable partitions.
2. Steel framing and supports for overhead doors and grilles.
3. Steel tube reinforcement for low partitions.
4. Steel framing and supports for mechanical and electrical equipment.
5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
6. Elevator machine beams, hoist beams, and divider beams.
7. Steel shapes for supporting elevator door sills.
8. Shelf angles.
9. Metal ladders.
10. Metal bollards.
11. Loose steel lintels.

D. Fabrication Engineering and Design: For installed products indicated to comply with performance requirements and design criteria, including comprehensive engineering analysis data signed and sealed by the Florida State licensed professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

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

B. 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."

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3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.5 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fabrication Engineering and Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design metal fabrications, including comprehensive engineering analysis for performance and design criteria specified. Provide calculations for items specified below and elsewhere in this Section, that have performance requirements.

B. Fixed Steel Ladders: Design and construct to support at least two dead loads of 300 lbs. concentrated between any two consecutive attachments, plus anticipated loads caused by ice buildup, winds, rigging and impact loads resulting from use of ladder safety devices.

1. Each step or rung shall be capable of supporting a single concentrated load of 300 lbs. applied in the middle of the step or sung, without deformation.
2. Provide steel landing platforms designed to support a live load of 100 psf. and a concentrated load of 300 lbf.
3. Where side rails of fixed ladders extend above a floor or platform at the top of the ladder, each side rail extension shall resist a single concentrated load of 100 lbs.
4. Provide rail and harness personal fall arrest system that limit free fall distance to 2 feet or less and support a tensile load of 3,000 pounds applied to the devise with lifeline or lanyard in fully extended position.

C. Gratings

1. Catwalks, Walkways, Elevated Platforms with Light Duty Gratings: Unless otherwise shown, design gratings for a uniform load of 60 psf and a concentrated load of 300 lbf on an area of 4 sq. in., whichever produces the greater stress. Limit deflection to L/360 or 1/4 in., whichever is less.

D. Bollards: Provide bollards complying with the following at columns exposed to vehicle traffic, within loading docks, and in parking garages along the driving lane. Engineer and install bollards in vehicle areas to withstand the following performance loads:

1. A concentrated load of 20 kips applied horizontally in any direction from which a vehicle can approach at a height to either 18 inches or 36 inches above the finished driving surface whichever creates the worst effect.
2. Crash rated to withstand ASTM F2656 for M30. Coordinate concrete pad reinforcing to meet required M rating.

E. 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.

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1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

F. Slip Resistance for Walking Surfaces: top surface to provide minimum wet dynamic coefficient of Friction (DCOF) of 0.42 for interior, and 0.50 for exterior in accordance with ANSI A326.3.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes. 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. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Stainless-Steel Bars and Shapes: ASTM A276, Type 304.

D. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

E. Rolled-Stainless-Steel Floor Plate: ASTM A793.

F. Steel Tubing: ASTM A500, cold-formed steel tubing.

G. Steel Pipe: ASTM A53/A53M, standard weight (Schedule 40) unless otherwise indicated.

H. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm) unless otherwise indicated.
2. Material: Cold-rolled steel, ASTM A1008/A1008M, commercial steel, Type B; 0.0966-inch (2.5-mm) minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.

I. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M.

2.4 NONFERROUS METALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.

B. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.

C. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

D. Bronze Extrusions: ASTM B455, Alloy UNS No. C38500 (extruded architectural bronze).

E. Bronze Castings: ASTM B584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semi-red brass).

F. Nickel Silver Castings: ASTM B584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

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2.5 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.
3. Provide stainless-steel fasteners for fastening nickel silver.
4. Provide bronze fasteners for fastening bronze.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F568M, Property Class 4.6); with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, (ASTM A563M, Class 10S3) heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593 (ASTM F738M); with hex nuts, ASTM F594 (ASTM F836M); and, where indicated, flat washers; Alloy Group 1 (A1).

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, unless otherwise indicated.
2. Material for Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: 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.

C. Epoxy Zinc-Rich Primer: Complying with SSPC Paint 20and compatible with topcoat.

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

a. Carboline Company; Carbozinc 859.
b. ICI Devoe Coatings; Catha-Coat 313.
c. Tnemec Company, Inc.; Tneme-Zinc 90-97.

D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

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G. Shrinkage-resistant Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107C1107M. Provide grout specifically recommended by manufacturer for interior applications.

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 (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. 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.

D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.

E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 24 inches (600 mm) o.c.

2.8 FABRICATION TOLERANCES

A. Squareness: 1/8-inch maximum difference in diagonal measurements.

B. Maximum offset between components at joints: 1/16-inch except that at welded joints no offset is allowed.

C. Maximum misalignment of adjacent members: 1/16-inch.

D. Maximum bow: 1/8-inch in 48 inches.

E. Maximum deviation from plane: 1/16-inch in 48 inches.

2.9 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

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C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated or if not indicated, as recommended by partition manufacturer with attached bearing plates, anchors, and braces as indicated, or if not indicated as recommended by partition manufacturer for operable partition supports, coordinated with operable partitions and including provisions for partition track anchorage as required to sustain imposed loads and to limit deflections to L/360 between hangers or as otherwise required by operable partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Steel Tube Supports for Vanities and Floating Countertops not supported by cabinetry below: Coordinate with Division 06 Section “Architectural Woodwork”, Division 09 “Gypsum Board Assemblies” and appropriate finish sections and as follows:

1. Utilize steel tube supports, steel angles, moment clips, steel clip angles and vertical steel tubes sized to support dead loads of countertops, and in addition the following loads:

   a. A uniform live load of 100 lbs. per linear foot and a concentrated point load of 300 pounds at any point.

2. Where exposed in the finish work, provide welded connections, ground smooth.
3. Where concealed, utilize bolts and connectors of capacity required to support
4. Prime paint for field painting specified in Division 09 Section "Painting" or clad with stainless steel cladding as detailed.
5. Anchor steel tubes to structural walls and slabs as required to support imposed loads specified and provide a secure and rigid installation.
6. Fasten tubes to countertops with fasteners applied through the tubes into the underside of tops, in sufficient quantity for a secure installation.

E. Fabricate supports for partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

F. Supports for Hoods: Provide engineering for miscellaneous metal supports for overhead mounted hoods coordinated with mechanical specifications and foodservice specifications. Provide mounting separate from suspended ceiling system, with neoprene isolators to mitigate vibrations and sounds of exhaust hoods. Coordinate with drawings for details and FPME and foodservice specifications for complete requirements.

G. Galvanize miscellaneous framing and supports in exterior envelopes, and where embedded in concrete..

H. Prime interior miscellaneous framing and supports with zinc-rich primer where indicated.

2.10 METAL FLOOR PLATE

A. Fabricate from rolled-aluminum-alloy tread plate.

1. Minimum Thickness: 3/16 inch (4.8 mm).

B. Provide stainless-steel angle supports as indicated.

C. Provide flush stainless-steel bar drop handles for lifting removable sections, one at each end of each section.

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2.11 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

C. Prime miscellaneous steel trim with primer specified in Section 099123 "Interior Painting."

2.12 METAL LADDERS

A. General:

1. Comply with ANSI A14.3, except for elevator pit ladders.
2. For elevator pit ladders, comply with ASME A17.1/CSA B44.

B. Steel Ladders:

1. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
2. Siderails: Continuous, 1/2-by-2-1/2-inch (12.7-by-64-mm) steel flat bars, with eased edges.
3. Rungs: 1-inch- (25-mm-) diameter, steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 3/4 inch (19 mm) in least dimension.
7. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.
8. Galvanize exterior ladders, including brackets.
9. Galvanize and prime elevator pit ladders, including brackets.
10. Prime exterior ladders, including brackets and fasteners, with primer specified in Section 099600 "High-Performance Coatings."

2.13 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe unless Schedule 80 pipe is required to meet performance requirements.

B. Fabricate bollards with 3/8-inch- (9.5-mm-) thick, square steel baseplates for bolting to concrete slab. Drill baseplates at four corners for 3/4-inch (19-mm) anchor bolts.

1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

C. Prime steel bollards and baseplates with primer specified in Division 09 Section "High-Performance Coatings."

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D. M-rated bollards used for facility protection: Provide engineered bollards and reinforcing cages that have been tested to meet ASTM F2656 for M30 rating. Anchor in accordance with approved engineered shop drawings.

1. Tops: Flat.
2. Exterior Finish: High-performance coating specified in Division 09 Section “High-Performance Coatings.”
3. Anchorage: Only per approved shop drawings.

2.14 METAL DOWNSPOUT BOOTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. J.R. Hoe & Sons Inc.
2. Neenah Foundry Company.

B. Source Limitations: Obtain downspout boots from single source from single manufacturer.

C. Provide downspout boots made from cast iron in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.

1. Outlet: Vertical, to discharge into pipe.

D. Prime cast-iron downspout boots with primer specified in Division 09 Section "High-Performance Coatings."

2.15 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize bearing and leveling plates.

2.16 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.

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 (200 mm) unless otherwise indicated.

C. Galvanize and prime loose steel lintels located in exterior walls.

2.17 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

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2.18 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.

2.19 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Prepare surfaces and shop prime with primers specified in Section 099123 "Interior Painting."

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.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLATION OF 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.

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B. Anchor supports for operable partitions, and overhead doors securely to, and rigidly brace from, building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Secondary Framing System: Remove spray fireproofing to allow beam clamp connection to steel beam legs with tight friction fit and a secure, rigid installation. Connect clamps to slotted channels sized and spaced to support imposed loads of ceiling panels, coordinated with work specified in related sections. Following anchorage coordinate with Applied Fireproofing work for restoration and replacement of sprayed on fireproofing. Verify that fireproofing completely encapsulates anchors to maintain fire rating requirements.

3.3 INSTALLATION OF LOOSE BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

C. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 INSTALLATION OF LADDERS

A. Vertical Ladders: Install at locations indicated on Drawings and where requiring access to equipment, catwalks, or gratings.

B. Securing Vertical Ladders: Secure vertical ladders to masonry or concrete with a minimum of two 1/2 in. diameter expansion bolts at each bracket unless additional attachments are required to sustain imposed loads. At walls with cold formed metal panels, provide metal plate backup and anchor vertical ladders to metal plate reinforcement.

3.5 INSTALLATION OF GRATINGS

A. Gratings: Install grating in accordance with requirements of ANSI/NAAMM MBG 531 "Metal Bar Grating Manual" including installation clearances and standard anchoring details. Weld gratings to supporting steel, except for sections which are hinged or required to be removable. Secure removable units to supporting members with type and size of clips and fasteners as recommended by grating manufacturer for type of installation conditions shown. Do not notch bearing bars at supports to maintain elevation. Secure toe plates to gratings by welding.

3.6 INSTALLATION OF METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

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1. Do not fill removable bollards with concrete.

B. Anchor bollards to existing construction with expansion anchors. Provide four 3/4-inch (19-mm) bolts at each bollard unless otherwise indicated.

1. Embed anchor bolts at least 4 inches (100 mm) in concrete.

3.7 INSTALLATION OF METAL DOWNSPOUT BOOTS

A. Anchor metal downspout boots to concrete or masonry construction to comply with manufacturer's written instructions.

B. Secure downspouts terminations to downspouts and substrate per manufacturer's instructions.

3.8 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with universal field primer compatible with primer used for shop painting to comply with SSPC-SP2 for touching up shop-painted surfaces.

a. Paint and coatings shall comply with VOC limits found in Division 01 Section "Sustainable Design Requirements" and emissions criteria meeting CDPH Standard Method v1.2
b. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 "Painting".

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

3.9 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.

END OF SECTION 055000

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SECTION 055113 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Preassembled steel stairs with concrete-filled treads.
2. Steel tube railings attached to metal stairs.
3. Steel tube handrails attached to walls adjacent to metal stairs.

C. Related Requirements:

1. Division 03 Section "Cast-In-Place Concrete" for concrete fill for stair treads and platforms.
2. Division 05 Section "Metal Floor Plate Stairs."
3. Division 09 Section "Gypsum Board Assemblies" for metal backing for anchoring railings.

1.2 COORDINATION

A. Do not install enclosing or concealing construction until after welds have been inspected, and tested and corrections have been made to defective applications.

B. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

C. Coordinate installation of anchorages for metal stairs and railings.

1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, blocking for attachment of wall-mounted handrails, and items with integral anchors, that are to be embedded in concrete or masonry.
2. Deliver such items to Project site in time for installation.

D. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.

E. Schedule installation of railings so wall attachments are made only to completed walls.

1. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For metal pan stairs and the following:

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1. Shop primer products.
2. Handrail wall brackets.
3. Grout.

B. Sustainable Design Action Submittals:

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:

a. Leadership Extraction Practices:

1) Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
2) Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.

a) Include statement indicating costs for each product having recycled content.

b. Sourcing of Raw Materials: For products that are responsibly sourced within 100 miles of project site, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.

2. Indoor Environmental Quality:

a. Laboratory Test Reports: For paints, coatings wet applied on site, indicating testing and compliance with the California Department of Public-Health (CDPH) Standard Method V1.2-2017, using the applicable exposure scenario.
b. Paints and Coatings: For wet applied on-site products, include printed statement of VOC content, showing compliance with the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective Feb. 5, 2016.

C. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.
4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.

D. Fabrication Engineering and Design: For stairs, railings, and guards indicated to comply with design criteria and performance requirements, provide comprehensive engineering analysis, including calculations, structural analysis data and details of anchorage and supports signed and sealed by the Florida State licensed professional engineer responsible for their preparation.

1. Review technical details of metal stairs, landings and railings with respect to design criteria and performance requirements, and be responsible for engineering modifications or revisions to details of the stair, landings, and railings as well as details for connections and members not specifically shown on the Drawings. Submit calculations for the following:

a. Straight runs.
b. Platforms and landings.

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c. Railings and handrails

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified manufacturer/fabricator and professional engineer's experience with providing fabrication engineering and design services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.

B. Sustainable Design Informational Submittals:

1. Building Product Disclosure and Optimization - Environmental Product Declarations

a. Submit product specific type III EPDs or Industry wide (generic) EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle-to-gate scope.

2. Building Product Disclosure and Optimization - Material Ingredients:

a. Material Ingredient Optimization: Submit at least one of the following:

1) GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
2) Cradle to Cradle: Manufacturer's published literature for the product bearing the Cradle to Cradle logo, with gold or platinum certification.
3) International Alternative Compliance Path - REACH Optimization.
4) Declare: Manufacturer's completed Product Declaration Form.
5) Other programs approved by USGBC.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator/Installer with a minimum five (5) consecutive year experience in the successful fabrication and installation of steel stair and railing systems of the type indicated for this project.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in Florida, and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of metal pan stairs that are similar to those indicated for this Project in material, design, and extent.

C. Welding Qualifications: Qualify procedures and personnel including shop welders, field welders, welding operators and tackers for the following periods of effectiveness according to the following:

1. Welding Standards

a. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
b. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

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2. Certification and qualification, including period of effectiveness of welding personnel to be as specified by AWS D1.1. Ensure certification remains in effect for duration of work provided welders are continuously engaged in performing the type of welding for which they are certified. Certification and re-certification of welding personnel is the Subcontractor's responsibility to maintain.

D. Reference Standards: Except as governed by requirements of local building codes, provide metal pan stair in accordance with applicable requirements and recommendations of the following organizations and standards:

1. American Institute of Steel Construction (AISC): Code of Practice for Structural Steel Buildings, and Bridges". Where a conflict exists between the AISC Code of Standard Practice and the Contract Documents, the Contract Documents govern.
2. American Iron and Steel Institute (AISI) "Specification for the Design of Cold–Formed Steel Structural Members".
3. National Association of Architectural Metal Manufacturers (NAAMM):

    a. "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

        1) Fire Stairs: Commercial class
        2) Decorative Stair: Architectural class

    b. "Metal Stairs Manual".
    c. "Pipe Railing Manual".
    d. "Metal Finishes Manual

4. Industrial Fasteners Institute (IFI): IFI "Fastener Standards".
5. Steel Structures Painting Council (SSPC): "Steel Structures Painting Manual, Volume 2, Systems and Specifications".

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Provide in place first installation mockup of one segment of each stair type with intermediate landing, and stringers, and railing specified. Include one run of stairs from post to post including handrail and bracket, steel railings and in fill, plus 4 complete treads.
2. Replace unsatisfactory work as directed until final acceptance by the Architect. Maintain accepted mock-ups throughout Project construction. Mock-up assemblies will be used as a standard for judging acceptability of Work on the Project.
3. Subject to compliance with the requirements, approved mockups may become part of the completed work if undisturbed at time of substantial completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.

1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect steel members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.

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a. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fabrication Engineering and Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to provide fabrication engineering and design of stairs, railings and guards, including attachment to building construction, using performance requirements and criteria indicated. Review the technical details of the metal stairs and landings with respect to performance criteria, and engineer modifications or revisions to details of the stair and landings as well as the details for connections and members not specifically shown on the Drawings.

B. Structural Performance of Stairs: Engineer and fabricate metal stairs to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft.
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.

C. Structural Performance of Railings: Design and fabricate railings, including attachment to building construction, to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

   a. Uniform load of 50 lbf/ft. applied in any direction.
   b. Concentrated load of 200 lbf applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

   a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
   b. Infill load and other loads need not be assumed to act concurrently.

3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

   a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

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B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Regional Materials: Products from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.

D. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

E. Steel Tubing for Railings: ASTM A500/A500M (cold formed).

1. Provide galvanized finish for exterior installations and where indicated.

F. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.

G. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011/A1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.

H. Galvanized-Steel Sheet: ASTM A653/A653M, G90 coating, either commercial steel, Type B, or structural steel, Grade 33, unless another grade is required by design loads.

I. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.3 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls.

1. Select fasteners for type, grade, and class required.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for exterior stairs, stairs indicated to be galvanized, and stairs indicated to be shop primed with zinc-rich primer.

E. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, 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 E488/E488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

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2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.4 MISCELLANEOUS MATERIALS

A. Handrail Wall Brackets: Cast stainless steel, center of rail 2-1/2 inches from face of wall.

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

a. Blum, Julius & Co., Inc.
b. The Wagner Companies., R&B Wagner, Inc.

B. Welding Electrodes: Comply with AWS requirements.

C. VOC and Emissions Requirements: Paints and Coatings, adhesives, and sealants, wet applied on site to comply with:

1. VOC limits (g/L) found in tables in Division 01 Section "Sustainable Design Requirements."
2. Emissions testing criteria of CHPH Standard vq1.2-2017.

D. Universal Shop Primer: 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.

E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish system indicated.

F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and ASTM A780/A780M and compatible with paints specified to be used over it.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

H. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for exterior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

I. For galvanized reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs and railings in shop to greatest extent possible.

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1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections 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. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 - No evidence of welded joint.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.

1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
2. Locate joints where least conspicuous.
3. Fabricate joints that will be exposed to weather in a manner to exclude water.
4. Provide weep holes where water may accumulate internally.

2.6 FABRICATION OF STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Commercial Class, unless more stringent requirements are indicated.

B. Stair Framing:

1. Fabricate stringers of steel plates or steel channels or steel rectangular tubes as indicated on Drawings.

a. Stringer Size: As required to comply with "Performance Requirements" Article.
b. Provide closures for exposed ends of channel and rectangular tube stringers.
c. Finish: Shop primed for interior stairs, galvanized for exterior stairs.

2. Construct platforms of steel plate or channel or rectangular tube headers and miscellaneous framing members as required to comply with "Performance Requirements" Article and as indicated on Drawings.

a. Provide closures for exposed ends of channel and rectangular tube framing.
b. Finish: Shop primed for interior stairs and galvanized for exterior stairs.

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3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
4. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below.

    a. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.

5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch.

1. Fabricate treads and landing subplatforms of exterior stairs so finished walking surfaces slope to drain.
2. Steel Sheet: Uncoated, cold or hot-rolled steel sheet.
3. Steel Sheet: Galvanized-steel sheet, where indicated.
4. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
5. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
6. Shape metal pans to include nosing integral with riser.
7. Attach abrasive nosings to risers.
8. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete during fabrication.
9. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

    a. Smooth Soffit Construction: Construct subplatforms with flat metal under surfaces to produce smooth soffits.

2.7 FABRICATION OF STAIR RAILINGS

A. Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.

1. Rails and Posts: 1-1/2-inch-square top and bottom rails and 1-1/2-inch-square posts.
2. Picket Infill: 1/2-inch- square pickets spaced less than 4 inches clear.
3. Intermediate Rails Infill: 1-1/2-inch-square intermediate rails spaced less than 21 inches clear.

B. Welded Connections: Fabricate railings with welded connections.

1. Fabricate connections that are exposed to weather in a manner that excludes water.

    a. Provide weep holes where water may accumulate internally.

2. Cope components at connections to provide close fit, or use fittings designed for this purpose.
3. Weld all around at connections, including at fittings.

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4. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
5. Obtain fusion without undercut or overlap.
6. Remove flux immediately.
7. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 - No evidence of a welded joint as shown in NAAMM AMP 521.

C. Form changes in direction of railings as follows:

1. By bending.

D. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

E. Close exposed ends of railing members with prefabricated end fittings.

F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

1. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

G. Connect posts to stair framing by direct welding unless otherwise indicated.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.

1. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
2. For galvanized railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
3. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
4. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

I. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports.

1. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.8 FINISHES

A. Finish metal stairs after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

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C. 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 products:

1. Exterior Stairs: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interior Stairs: SSPC-SP 3, "Power Tool Cleaning."

D. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.

1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLING METAL PAN STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.

1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates.

a. Clean bottom surface of plates.
b. Set plates for structural members on wedges, shims, or setting nuts.
c. Tighten anchor bolts after supported members have been positioned and plumbed.
d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.

1) Neatly finish exposed surfaces; protect grout and allow to cure.

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2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
2. 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.
3. Comply with requirements for welding in "Fabrication, General" Article.

F. Place and finish concrete fill for treads and platforms to comply with Division 03 Section "Cast-in-Place Concrete."

1. Install abrasive nosings with anchors fully embedded in concrete.
2. Center nosings on tread width.

3.3 INSTALLING RAILINGS

A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.

1. Space posts at spacing indicated or, if not indicated, as required by design loads.
2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet.
4. Secure posts and rail ends to building construction as follows:

a. Anchor posts to steel by welding or bolting to steel supporting members.
b. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with post-installed anchors and bolts.

B. Attach handrails to wall with wall brackets.

1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
2. Secure wall brackets to building construction as follows:

a. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
b. For hollow masonry anchorage, use toggle bolts.
c. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

3.4 REPAIR

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

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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 A780/A780M.

END OF SECTION 055113

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SECTION 055119 - METAL GRATING STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents. This Section includes, but is not limited to:

1. Industrial Class stairs with steel-grating treads.
2. Steel railings attached to metal stairs.
3. Steel handrails attached to walls adjacent to metal stairs.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs and railings.

1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, blocking for attachment of wall-mounted handrails, and items with integral anchors, that are to be embedded in concrete or masonry.
2. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.

D. Schedule installation of railings so wall attachments are made only to completed walls.

1. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For metal grating stairs and the following:

1. Gratings.
2. Railing components
3. Grout.

B. Sustainable Design Action Submittals:

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:

a. Leadership Extraction Practices:

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1) Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
2) Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.

a) Include statement indicating costs for each product having recycled content.

b. Sourcing of Raw Materials: For products that are responsibly sourced within 100 miles from project site, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.
4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.

D. Fabrication Engineering and Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing fabrication -design engineering services of the kind indicated, including documentation that engineer is licensed in the State of Florida.

B. Sustainable Design Informational Submittals:

1. Building Product Disclosure and Optimization - Environmental Product Declarations:

a. Submit product specific type III EPDs or Industry wide (generic) EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.
b. EPD Optimization: For materials, indicating embodied carbon/LCA optimization report or action plan.

2. Building Product Disclosure and Optimization - Material Ingredients:

a. Material Ingredient Optimization: Submit at least one of the following:

1) GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
2) Cradle to Cradle: Manufacturer's published literature for the product bearing the Cradle to Cradle logo, with gold or platinum certification.
3) International Alternative Compliance Path - REACH Optimization.

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4) Declare: Manufacturer's completed Product Declaration Form.
5) Other programs approved by USGBC.

C. Fabrication Engineering and Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Welding certificates.

E. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Florida and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal grating stairs that are similar to those indicated for this Project in material, design, and extent

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

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.

1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect steel members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.

    a. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fabrication Engineering and Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs and railings, including attachment to building construction.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360.

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C. Structural Performance of Railings: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction at the top and to transfer load through supports to structure..
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction at any point and have supporting structure to transfer this loading to appropriate structural elements of the building.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m). and a concentrated upward load of 50 lbs. applied at the most critical location.

3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Steel Bars for Grating Treads: ASTM A36/A36M or steel strip, ASTM A1011/A1011M or ASTM A1018/A1018M.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

D. Steel Wire Rod for Grating Crossbars: ASTM A510/A510M.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

E. Steel Tubing for Railings: ASTM A500/A500M (cold formed) or ASTM A513/A513M.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

F. Provide galvanized finish for exterior installations and where indicated.

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G. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

H. Cast-Abrasive Nosings: Cast iron, with an integral abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.3 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls.

1. Select fasteners for type, grade, and class required.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be galvanized.

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, 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 E488/E488M, conducted by a qualified independent testing agency.

1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.4 MISCELLANEOUS MATERIALS

A. Welding Electrodes: Comply with AWS requirements.

B. Shop Primers: Provide primers that comply with Division 09 Section "High-Performance Coatings."

C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

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E. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for exterior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs and railings in shop to greatest extent possible.

1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections 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. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #4 - Good quality, uniform undressed weld with minimal splatter.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.

1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
2. Locate joints where least conspicuous.
3. Fabricate joints that are exposed to weather in a manner to exclude water.
4. Provide weep holes where water may accumulate internally.

2.6 FABRICATION OF STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Industrial Class, unless more stringent requirements are indicated.

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B. Stair Framing:

1. Fabricate stringers of steel channels.

   a. Stringer Size: As required to comply with "Performance Requirements" Article.
   b. Provide closures for exposed ends of channel stringers.
   c. Finish: Galvanized.

2. Construct platforms and tread supports of steel plate or channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.

   a. Provide closures for exposed ends of channel framing.
   b. Finish: Galvanized.

3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers.
4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."

1. Fabricate treads and platforms from welded steel grating with 1-by-3/16-inch (25-by-5-mm) bearing bars at 11/16 inch (17 mm) o.c. and crossbars at 4 inches (100 mm) o.c.

   a. Surface: Serrated.
   b. Finish: Galvanized.

2. Fabricate grating treads with cast-abrasive nosing and with steel angle or steel plate carrier at each end for stringer connections.

   a. Secure treads to stringers with bolts.

3. Fabricate grating platforms with nosing matching that on grating treads.

   a. Secure grating to platform framing by welding.

D. Risers: Open.

E. Toe Plates: Provide toe plates around openings and at edge of open-sided floors and platforms, and at open ends and open back edges of treads.

1. Material and Finish: Steel plate to match finish of other steel items.
2. Fabricate to dimensions and details indicated.

2.7 FABRICATION OF STAIR RAILINGS

A. Comply with applicable requirements in Section 055213 "Pipe and Tube Railings."

B. Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.

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1. Rails and Posts: 1-5/8-inch- (41-mm-) diameter top and bottom rails and 1-1/2-inch- (38-mm-) square posts.
2. Picket Infill: 1/2-inch- (13-mm) round pickets spaced less than 4 inches (100 mm) clear.

C. Welded Connections: Fabricate railings with welded connections.

1. Fabricate connections that are exposed to weather in a manner that excludes water.

   a. Provide weep holes where water may accumulate internally.

2. Cope components at connections to provide close fit, or use fittings designed for this purpose.
3. Weld all around at connections, including at fittings.
4. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
5. Obtain fusion without undercut or overlap.
6. Remove flux immediately.
7. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #4 - Good quality, uniform undressed weld with minimal splatter as shown in NAAMM AMP 521.

D. Form changes in direction of railings as follows:

1. As detailed.

E. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required.

1. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

F. Close exposed ends of railing members with prefabricated end fittings.

G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

1. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

H. Connect posts to stair framing by direct welding unless otherwise indicated.

I. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.

1. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
2. For galvanized railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
3. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
4. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.

J. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports.

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1. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.8 FINISHES

A. Finish metal stairs after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

2.9 SOURCE QUALITY CONTROL

A. The Owner's Special Inspection Agency shall have the option to perform periodic inspections during welding of the following items, provided the materials, welding procedures and qualifications of welders are verified prior to the start of the work; periodic inspections are made of the work in progress and a visual inspection of all welds is made prior to completion or prior to shipment of shop welding.

1. Welding:

a. Full penetration welds: Test all full penetration welds for soundness by means of either radiographic or ultrasonic testing in accordance with AWS D1.1 and ASTM E164 procedures. Repair all flaws in plate or flange material revealed during such tests.
~~b.~~ Partial penetration welds: Test all partial penetration welds for soundness by means of visual and magnetic particle inspection unless other methods are specified in the Contract Documents. Repair all flaws in plate or flange material revealed during such tests~~.~~
c. Fillet welds: Visually inspect all fillet welds by AWS certified welding inspector. In addition, test ten percent (10%) of all fillet welds using a non-destructive method, such as dye penetrant or magnetic particle. Select test locations randomly throughout the structure, but test at least one weld in each location with 6 or more welds per connection. If, in the opinion of the Welding Inspector, this testing discloses a large ratio (10% or more) of unacceptable welds, the required percentage of tested welds may be increased to 100%, all at the Stair Subcontractor's expense. All defects found visually in fillet welds shall be non-destructively tested by magnetic particle or dye-penetrant methods.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.

1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.

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B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLING METAL STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.

1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

1. Grouted Baseplates: Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces.

a. Clean bottom surface of baseplates.
b. Set steel-stair baseplates on wedges, shims, or leveling nuts.
c. After stairs have been positioned and aligned, tighten anchor bolts.
d. Do not remove wedges or shims, but if protruding, cut off flush with edge of bearing plate before packing with grout.
e. Promptly pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

1) Neatly finish exposed surfaces; protect grout and allow to cure.
2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
2. 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.
3. Comply with requirements for welding in "Fabrication, General" Article.

3.3 INSTALLING RAILINGS

A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.

1. Space posts at spacing indicated or, if not indicated, as required by design loads.
2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).
4. Secure posts and rail ends to building construction as follows:

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a. Anchor posts to steel by welding to steel supporting members.
b. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with post-installed anchors and bolts.

B. Attach handrails to wall with wall brackets.

1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
2. Secure wall brackets to building construction as required to comply with performance requirements.

3.4 FIELD QUALITY CONTROL

A. Inspections: The Owner will engage a qualified independent Special Inspection Agency to perform the following:

1. Inspect the metal grating stair steel and associated railing fabrication for field welding, as Work progresses in accordance with Florida Building Code Chapter 17 as applicable to metal grating stair and associated railing construction. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Architect/Engineer for final acceptance.

a. Field inspection of steel shall include connections, levelness, plumbness and alignment of the stair and railing systems in conformance with AWS welding methods, examination of surface before welding, examination and testing of completed welds.

2. If testing finds welds are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.
3. Welds will be considered defective if they do not pass tests and inspections.

a. Remove and replace welds that does not pass tests and inspections, and retest.
b. Additional testing and inspecting, beyond a follow up inspection, shall be at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

B. Railing Testing: If installation of railing is not in compliance with approved shop drawings and calculations, stair and railing Subcontractor shall test railings in the presence of the special inspector in accordance with ASTM E894 and ASTM E935 to verify for compliance with railing performance requirements and to validate fabrication engineering.

1. Prepare test and inspection reports and submit to the Owner, Architect, and AHJ.

3.5 REPAIR

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with LEED V4.1 compliant primer compatible with primer as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Paints and coatings shall comply with VOC limits found in Division 01 Section "Sustainable Design requirements" and emissions criteria meeting CDPH Standard Method v1.2
2. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

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3. The maximum allowable VOC content for field applied anti-corrosive touch-up paint shall be 250 grams/liter.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055119

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SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Division in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Stainless-steel tube handrails and brackets.

C. Related Requirements:

1. Division 05 Section "Glazed Decorative Metal Railings" for structural glass supporting handrails and railings.

1.2 COORDINATION

A. Do not install enclosing or concealing construction until after welds have been inspected and tested and corrections have been made to defective applications.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

B. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:

a. Leadership Extraction Practices:

1) Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
2) Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.

a) Include statement indicating costs for each product having recycled content.

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b. Sourcing of Raw Materials: For products that are responsibly sourced within 100 miles of project site, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.

2. Indoor Environmental Quality, Low Emitting Materials:

a. Laboratory Test Reports: For adhesives, sealants, paints, coatings wet applied on site, indicating testing and compliance with the California Department of Public-Health (CDPH) Standard Method V1.2-2017, using the applicable exposure scenario.
b. Adhesives and Sealants: For wet applied on site products, submit printed statement showing compliance with the applicable chemical content requirements of SCAQMD Rule 1168, effective July 1, 2005 and rule amendment date of October 6, 2017.
c. Alternative tests for VOC above include ASTM D2369-10; ISO 11890 part 1; ASTM D6886-03; or ISO 11890-2.
d. Methylene Chloride and perchloroethylene may not be added to paints, coating, adhesive or sealants.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Where railings are provided in conjunction with stairs, coordinate shop drawings.

D. Samples: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including finish.
2. Fittings and brackets.

E. Fabrication Engineering: For railings, indicated to comply with performance requirements and criteria, provide comprehensive engineering analysis data signed, including calculations, structural analysis data and details of anchorage and supports indicating compliance with performance requirements, signed, and sealed by the qualified Florida professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified manufacturer/fabricator and professional engineer.

B. Welding certificates and Procedures: Submit for record written data on the materials, welding procedures and qualifications of welders in accordance with requirements of AWS D1.1 and the Florida Building Code.

1. For stainless steel welds or bimetallic welds between stainless and carbon steels, submit for review welding procedures and processes per AWS D1.6 requirements.

C. Shop and field quality-control reports and Inspection reports

D. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

E. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.

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1.5 QUALITY ASSURANCE

A. 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 handrails and railings that are similar to those indicated for this Project in material, design, and extent.

B. Manufacturer Qualifications: Provide pipe and tube handrails fabricated by a firm with at least 10 years' experience specializing in custom railing fabrication as indicated and specified.

C. Installer Qualifications:

1. Minimum five consecutive years' experience in the successful installation of railing systems of the type indicated for this project.
2. Installer shall be acceptable to the Manufacturer of the railing system.

D. Welding Qualifications: Qualify procedures and personnel according including shop welders, field welders, welding operators and tackers for the following periods of effectiveness to the following:

1. Welding Standards

a. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

2. Certification and qualification, including period of effectiveness of welding personnel shall be as specified by AWS D1.1. Certification shall remain in effect for duration of work provided welders are continuously engaged in performing the type of welding for which they are certified. Certification and re-certification of welding personnel is the Subcontractor's responsibility to maintain.

E. Reference Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following organizations and Standards:

1. American Institute of Steel Construction (AISC) "Manual of Steel Construction".
2. American Iron and Steel Institute (AISI) "Cold Formed Steel Design Manual".
3. National Association of Architectural Metal Manufacturers (NAAMM):

a. AMP-521 "Pipe Handrails and Railing Systems Manual including Round Tube."

4. Industrial Fasteners Institute (IFI): IFI "Fastener Standards".

F. Regulatory Requirements: Comply with the requirements of Part 1910 of the Occupational Safety and Health Standards (OSHA), and the American Disabilities Act (ADA) as applicable to handrails and the protection of openings.

G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Provide in place first installation mockup of one segment of railing specified. Include handrail and bracket.
2. Replace unsatisfactory work as directed until final acceptance by the Architect.
3. Maintain accepted mock-ups throughout Project construction.

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4. Mock-up assemblies will be used as a standard for judging acceptability of Work on the Project.
5. Subject to compliance with the requirements, approved mockups may become part of the completed work if undisturbed at time of substantial completion.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Railing Subcontractor shall engage a qualified testing agency to perform preconstruction testing on laboratory mockups. Retesting of products that fail to meet specified requirements shall be done at Subcontractor's expense.

1. Build laboratory mockups at testing agency facility; use personnel, materials, and methods of construction that will be used at Project site.
2. Test railings in accordance with ASTM E894 and ASTM E935.

1.7 DELIVERY, STORAGE, AND HANDLING

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

B. Store handrails and railings in a dry, well-ventilated, weathertight place.

1. Handle in such a manner so as to protect surfaces and to prevent distortion of, and any other type of damage to, fabricated pieces.

1.8 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Stainless-Steel Pipe and Tube Railings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Basis of Design Manufacturer: C.R. Laurence Co.
b. Blum, Julius & Co., Inc.
c. R & B Wagner, Inc.
d. Tubular Specialties Manufacturing, Inc.
e. Tuttle, a Dant Clayton Division.
f. VIVA Railings, LLC.

B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

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2.2 PERFORMANCE REQUIREMENTS

A. Fabrication Engineering: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to provide engineering fabrication of railings, including attachment to building construction, using performance requirements and criteria indicated. Review the technical details of the railings with respect to performance criteria, and engineer modifications or revisions to details of the railings as well as the details for connections and members not specifically shown on the Drawings.

B. General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Stainless Steel: 60 percent of minimum yield strength.

C. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails:

a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction at the top and to transfer load through supports to structure.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction at any point and have supporting structure to transfer this loading to appropriate structural elements of the building.
c. Uniform and concentrated loads need not be assumed to act concurrently.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

2.3 METALS, GENERAL

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

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.4 STAINLESS STEEL

A. Tubing: ASTM A554, Grade MT 304 for interior use and Grade MT 316L for exterior use.

B. Castings: ASTM A743/A743M, Grade CF 8 or CF 20 for interior use and Grade CF 8M or CF 3M for exterior use.

C. Plate and Sheet: ASTM A240/A240M or ASTM A666, Type 304 for interior use.

2.5 FASTENERS

A. General: Provide the following:

1. Stainless-Steel Railings: For interior use Type 304 stainless-steel fasteners.

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2. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For stainless-steel railings, 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. VOC and Emissions Requirements: Paints and coatings, adhesives and sealants, wet applied on site shall comply with:

1. VOC limits (g/L) found in tables in Division 01 Section "Sustainable Design Requirements."
2. Emissions testing criteria of CHPH Standard v1.2-2017.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.7 FABRICATION

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

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

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H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 - No evidence of welded joint.

I. Form Changes in Direction as Follows:

1. As detailed.

J. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of railing members with prefabricated end fittings.

L. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

2.8 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines, or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Stainless Steel Tubing Finishes:

1. 180-Grit Polished Finish: Uniform, directionally textured finish.

D. Stainless Steel Sheet and Plate Finishes:

1. Directional Satin Finish: ASTM A480/A480M, No.3.

E. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.9 SOURCE QUALITY CONTROL

A. The Owner's Special Inspector shall have the option to perform periodic inspections during welding of the following items, provided the materials, welding procedures and qualifications of welders are verified prior to the start of the work; periodic inspections are made of the work in progress and a visual inspection of all welds is made prior to completion or prior to shipment of shop welding.

B. Welding:

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1. Full penetration welds: Test all full penetration welds for soundness by means of either radiographic or ultrasonic testing in accordance with AWS D1.1 and ASTM E164 procedures. Repair all flaws in plate or flange material revealed during such tests.
2. Partial penetration welds: Test all partial penetration welds for soundness by means of visual and magnetic particle inspection, unless other methods are specified in the Contract Documents. Repair all flaws in plate or flange material revealed during such tests.
3. Fillet welds: Visually inspect all fillet welds by AWS certified welding inspector. In addition, test ten percent (10%) of all fillet welds using a non-destructive method, such as dye penetrant or magnetic particle. Select test locations randomly throughout the structure, but test at least one weld in each location with 6 or more welds per connection. If, in the opinion of the Welding Inspector this testing discloses a large ratio (10% or more) of unacceptable welds, the required percentage of tested welds may be increased to 100%, all at the Subcontractor's expense. All defects found visually in fillet welds shall be non-destructively tested by magnetic particle or dye-penetrant methods.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

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B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ATTACHING RAILINGS

A. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

B. Attach railings to structural glass with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

3.5 ADJUSTING AND CLEANING

A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

3.6 PROTECTION

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

END OF SECTION 055213

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SECTION 057000 - DECORATIVE METAL

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Column Covers.
2. Decorative steel, stainless steel, and anodized aluminum elements as indicated on Finish Legend and in locations indicated on Drawings.

C. Related Requirements:

1. Division 05, Section "Metal Fabrications" for non-decorative metal fabrications.
2. Division 05 Section "Decorative Metal Railings" for decorative metal railings.
3. Division 05 Section "Glazed Decorative Metal Railings" for glazed decorative metal railings.
4. Division 05 Section "Decorative Formed Metal" for decorative metal items made from sheet metal.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including finishing materials.

B. Sustainable Design Submittals:

1. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Show fabrication and installation details. Indicate materials, finishes, fasteners, anchorages, and accessory items.

D. Samples for Initial Selection: For products involving selection of color, texture, or design including mechanical finishes.

E. Samples for Verification: For each profile and pattern of fabricated metal and for each type of exposed metal finish prepared on metal of same thickness and alloy indicated for the Work. If finishes involve normal color and texture variations, include sample sets, consisting of two or more units, showing the full range of variations expected.

1. Include 6-inch long sections of linear shapes.
2. Include 6-inch square samples of plates.
3. Full-size Samples of castings and forgings.

a. For custom castings, submit finished Samples showing ability to reproduce detail, cast-metal color, and quality of finish. Samples may be of similar previous work.

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4. Samples of welded joints showing quality of workmanship, including dressing exposed and contact surfaces, and color matching of materials.

1.3 INFORMATIONAL SUBMITTALS

A. Fabrication Engineering and Design Submittal: For items indicated to comply with performance requirements and design criteria, including analysis data, calculations and shop drawings, signed and sealed by the Florida State Licensed professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Arrange for installation of decorative metal specified in this Section by the same firm that fabricated it.

B. Fabricator Qualifications: A firm experienced in producing decorative 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.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Florida and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for this Project in material, design, and extent.

D. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.6, "Structural Welding Code--Stainless Steel."
3. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

E. 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 mockups of decorative metal assemblies for one portion of project as directed by Architect, prior to fabricating entire system.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver shop-fabricated sub-assemblies ready for re-assembly in the field.

B. Store decorative metal inside a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with decorative metal by field measurements before fabrication and indicate measurements on Shop Drawings.

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1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating decorative metal elements without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. If practical, provide allowance for trimming and fitting at site.

1.7 COORDINATION

A. Coordinate installation of anchorages for decorative metal items.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Engineer exterior installed decorative metal fabrications to comply with performance requirements so that installed items will perform without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Exterior decorative metal fabrications 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. Noise or vibration created by wind and thermal and structural movements.
    c. Loosening or weakening of fasteners, attachments, and other components.

B. In engineering decorative metal to withstand structural loads indicated, determine allowable design working stresses of decorative materials based on the following:

1. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.
2. Stainless Steel: 60 percent of minimum yield strength.
3. Steel: 72 percent of minimum yield strength.

C. Design, fabricate and install metal column covers and wall panels to withstand a 10 lb. load applied at midspan with maximum deflection of 1/4 inch and no permanent deflection.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Use metal materials, with smooth, flat surfaces unless otherwise indicated. Use metal materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes or other imperfections on finished units.

2.3 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher, with strength and durability properties not less than that of alloy and temper designated below.

B. Extruded Bars and Shapes: ASTM B221M (ASTM B221), Alloy 6063-T5/T52.

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C. Plate and Sheet: ASTM B209M (ASTM B209), Alloy 5005-H32.

D. Die and Hand Forgings: ASTM B247M (ASTM B247), Alloy 6061-T6.

E. Castings: ASTM B26/B26M, Alloy A356.0-T6.

2.4 STEEL AND IRON

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Plates, Shapes, and Bars: ASTM A36/A36M.

C. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M unless otherwise indicated.

D. Steel Sheet, Cold Rolled: ASTM A1008/A1008M, either commercial steel or structural steel, exposed.

2.5 STAINLESS STEEL

A. Tubing: ASTM A554, Grade MT 304.

B. Castings: ASTM A743/A743M, Grade CF 8 or CF 20.

C. Sheet, Strip, Plate, and Flat Bar: ASTM A666, Type 304.

D. Bars and Shapes: ASTM A276, Type 304.

2.6 FASTENERS

A. Fastener Materials: Unless otherwise indicated, provide the following:

1. Aluminum Items: Stainless-steel fasteners.
2. Uncoated-Steel Items: Plated steel fasteners complying with ASTM B633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed, Type 304 stainless steel fasteners where exposed.
3. Stainless-Steel Items: Stainless-steel fasteners.
4. Dissimilar Metals: Stainless-steel fasteners.
5. Fasteners for Anchoring to Other Construction: Unless otherwise indicated, select fasteners of type, grade, and class required to produce connections suitable for anchoring indicated items to other types of construction indicated.

B. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

C. Post-Installed Anchors: Torque-controlled expansion type or chemical type.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941M (ASTM F1941), Class Fe/Zn 5 unless otherwise indicated.
2. Material for Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F738M (ASTM F593), and nuts, ASTM F836M (ASTM F594).

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2.7 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.8 FABRICATION, GENERAL

A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly.

1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.
3. Use connections that maintain structural value of joined pieces.

B. Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.

C. Mill joints to a tight, hairline fit. Cope or miter corner joints.

D. 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.

E. Comply with AWS for recommended practices in shop and field welding. Weld behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces.

1. Where welding cannot be concealed behind finished surfaces, finish joints to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 Welds: no evidence of a welded joint.
2. Use groove and butt welds to greatest extent practicable. Use fillet welds only when other types of welds are not possible.

F. Provide castings that are sound and free of warp, cracks, blowholes, or other defects that impair strength or appearance. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks.

G. At rectangular and round discontinuous hollow sections, provide end caps.

2.9 COLUMN COVERS

A. Column Covers, Snap-Together Type: Fabricate custom column covers to profiles and dimensions shown, with interlocking shapes fabricated from 1/8 inch thick aluminum plate. Fabricate covers in sections necessary to create the shapes shown and with rolled over interlocking edges for a tight joint between sections when installed. Create covers with two color finishes as detailed.

1. Fabricate covers with hairline joints products by bending or break-forming returns and mating ends to column cover sections to form closures that will engage continuous mounting clips.

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2. Fabricate covers with horizontal butt joints, tightly fit and backed with a sleeve for field splicing.
3. Fabricate ceiling closures as an adjustable inset reveal matching column covers.
4. Fabricate floor closures from stainless steel bases as specified in this section
5. Provide covers complete with miscellaneous metal brackets, channels, and fastenings necessary to secure to columns and coordinate with metal base fabrication to ensure tight fit.
6. Apply sound damping compound to backs of covers to ensure that sound is dampened.
7. Manufacturers: Products specified below are as fabricated by Gordon International and serve as the basis of design for the project. Equivalent column covers from Pittcon Industries, or Fry Reglet will be considered, subject to compliance with design and performance.
8. Provide types indicated on Drawings.

2.10 DECORATIVE WALL PANELS

A. Fabricate wall panels from steel plate of thickness and sizes indicated.

B. Fabrication:

1. Panel joints shall be flush type unless otherwise shown or specified.
2. Provide blocking and framing, anchors, clips, splines, supporting and attaching devices.
3. Provide cut-outs to receive attachments, mechanical and electrical work as required. 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. Smooth edges of cutouts.
4. Provide panel clips in quantity and spacing to sustain loading and prevent warping and bowing of panels.

C. Accessories:

1. Panel Clips: Aluminum interlocking offset panel fasteners; type, size and quantity for the condition of use.

2.11 DECORATIVE MECHANICAL GRILLES

A. Fabricate decorative grilles and meshes from laser cut or perforated aluminum sheet or plate, as standard with manufacturer, of thickness, size, and pattern indicated.

1. Drawings indicate metal patterns required and are based on products of one manufacturer. Metal patterns produced by other manufacturers may be considered, provided deviations are minor and do not change design concept as judged solely by Architect.

B. Laser Cut Grilles and Meshes, Basis of Design Manufacturer: Moz Designs:

1. Type: Laser Cut Aluminum “Moz Metals.”
2. Material: 3/16” thick Aluminum, Type 5052 alloy complying with ASTM B209/B209M.
3. Sheet Sizes: 4’ by 8’, standard size.
4. Pattern Name: As indicated on Drawings.
5. Color: As indicated on Drawings, on both sides.
6. Finish: As indicated on Drawings.

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C. Corrugated Metal Sheets, Basis of Design Manufacturer: Moz Designs:

1. Type: Corrugated Aluminum “Moz Metals.”
2. Material: 0.040” thick Aluminum, Type 5052 alloy complying with ASTM B209/B209M.
3. Profile: 5/8-inch deep corrugations.
4. Sheet Sizes: Manufacturer’s standard.
5. Pattern Name: As indicated on Drawings.
6. Color: As indicated on Drawings, both sides.
7. Finish: As indicated on Drawings.

2.12 METAL BASES

A. Provide shop fabricated metal bases of profiles and dimensions shown, at locations as indicated on the drawings.

1. Materials: As indicated on Drawings.
2. Fabricate bases from minimum 16 gauge sheet break-formed to profile indicated.
3. Provide necessary concealed fasteners, z-clips, construction adhesives shims, back-up angles and plates required to provide sound, and secure flush and plumb installation.
4. Dimensions: As indicated on Drawings.

B. Shop fabricate bases with slightly eased edges and corners. There shall be no sharp edges in the finish work.

C. Run grain of finish parallel to long dimension (horizontally).

D. Provide bases in longest sections, with joints on the column lines, building module or wall assembly module. Provide 3 ft. x 3 ft. long formed one piece corner sections for inside and outside corners. Comply with final approved shop drawings for seam locations and details between adjacent base sections. Seams between bases shall occur strictly at seams in panels above. Install bases so that seams between align with seams in panels above.

2.13 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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

2.14 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic Two-Coat Fluoropolymer Finish: System consisting of corrosion inhibitive primer, fluropolymer mica color coat complying with AAMA 2605 and AA-C12C42R1x, containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat and not less than 1.2 mils dry film thickness. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.

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

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D. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 0.04 mm (1.5 mils). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: Match Architect's sample.

2.15 STAINLESS-STEEL FINISHES

A. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

B. Directional Satin Finish: No. 4.

C. Mirrorlike Reflective, Nondirectional Polish: No. 8.

2.16 STEEL AND IRON FINISHES

A. Powder-Coat Finish: Prepare, treat, and coat nongalvanized ferrous metal to comply with resin manufacturer's written instructions and as follows:

1. Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Treat prepared metal with iron-phosphate pretreatment, rinse, and seal surfaces.
3. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils.
4. Color: Match **PT-16**.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide anchorage devices and fasteners where needed to secure ornamental metal to in-place construction.

B. Perform cutting, drilling, and fitting required to install ornamental metal. Set products accurately in location, alignment, and elevation; measured from established lines and levels. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.

C. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, with uniform reveals and spaces for sealants and joint fillers. Where cutting, welding, and grinding are required for proper shop fitting and jointing of ornamental metal, restore finishes to eliminate evidence of such corrective work.

D. 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.

E. Restore protective coverings that have been damaged during shipment or installation. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at same location.

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F. Retain protective coverings intact; remove coverings simultaneously from similarly finished items to preclude nonuniform oxidation and discoloration.

G. Field Welding: Comply with applicable AWS specification for procedures of manual shielded metal arc welding, for appearance and quality of welds, and for methods used in correcting welding work. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Grind exposed welded joints smooth and restore finish to match finish of adjacent surfaces.

H. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.2 INSTALLING METAL BASE MOLDINGS

A. Mount metal base moldings at heights and in positions indicated.

1. Secure to framing and blocking with specified fasteners.

3.3 CLEANING

A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.

3.4 PROTECTION

A. Protect finishes of ornamental metal from damage during construction period with temporary protective coverings approved by ornamental metal fabricator. Remove protective covering at time of Substantial Completion.

B. 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.

END OF SECTION 057000

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SECTION 057100 - DECORATIVE METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents**.**

B. Section includes, but is not limited to:

1. Decorative metal stairs.

C. Related Requirements:

1. Division 03 Section “Concrete Overlayment.”
2. Division 03 Section “Precast Cementitious Stair Treads.”
3. Division 05 Section "Glazed Decorative Metal Railings."

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs.

1. 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.
2. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

A. Product Data: For metal stairs and the following:

1. Shop primer products.
2. Precast tread, riser, cladding, facing units.
3. Grout.

B. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:

a. Leadership Extraction Practices:

1) Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
2) Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.

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a) Include statement indicating costs for each product having recycled content.

b. Sourcing of Raw Materials: For products that are required responsibly sourced within 100 miles from the project side, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.

2. Indoor Environmental Quality, Low Emitting Materials:

a. Laboratory Test Reports: For adhesives, sealants, paints, coatings wet applied on site, indicating testing and compliance with the California Department of Public-Health (CDPH) Standard Method V1.2-2017, using the applicable exposure scenario.
b. Paints, and Coatings: For wet applied on site products, include printed statement of VOC content, showing compliance with the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5. 2016.
c. Adhesives and Sealants: For wet applied on site products, submit printed statement showing compliance with the applicable chemical content requirements of SCAQMD Rule 1168, effective July 1, 2005 and rule amendment date of October 6, 2017.
d. Alternative tests for VOC above include ASTM D2369-10; ISO 11890 part 1; ASTM D6886-03; or ISO 11890-2.
e. Methylene Chloride and perchloroethylene may not be added to paints, coating, adhesive or sealants

C. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each landing and level.

D. Samples for Verification: For each type and finish of tread.

E. Fabrication Engineering and Design Submittal: For decorative metal stairs, and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Submit comprehensive engineering analysis, including calculations structural analysis data and details of anchorage and supports indicating compliance performance requirements.
2. Review technical details of metal stairs, landings, and railings with respect to design performance criteria, and be responsible for engineering modifications or revisions to details of the stair, landings, and railings as well as details for connections and members not specifically shown on the Drawings. Submit calculations for the following:

a. Straight runs.
b. Platforms and landings.
c. Railings and handrails

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1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing fabrication engineering and design engineering services of the kind indicated, including documentation that the engineer is licensed in the State in which Project is located.

B. Sustainable Design Informational Submittals:

1. Building Product Disclosure and Optimization - Environmental Product Declarations:

   a. Submit product specific type III EPDs or Industry wide (generic) EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.
   b. EPD Optimization: For materials, indicating embodied carbon/LCA optimization report or action plan.

2. Building Product Disclosure and Optimization - Material Ingredients

   a. Material Ingredient Optimization: Submit at least one of the following:

      1) GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
      2) Cradle to Cradle: Manufacturer's published literature for the product bearing the Cradle to Cradle logo, with gold or platinum certification.
      3) International Alternative Compliance Path - REACH Optimization.
      4) Declare: Manufacturer's completed Product Declaration Form.
      5) Other programs approved by USGBC.

C. Welding certificates and Procedures: Submit for record written data on the materials, welding procedures and qualifications of welders in accordance with requirements of AWS D1.1 and the Florida Building Code. For stainless steel welds or bimetallic welds between stainless and carbon steels, submit for review welding procedures and processes per AWS D1.6 requirements. Submit all welding and qualification procedures to the Special Inspection Agency for approval before submitting to the Design Professionals.

D. Shop and field quality-control reports and Inspection reports.

E. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of productswith a minimum five (5) consecutive year experience in the successful fabrication and installation of decorative metal stair and railing systems of the type indicated for this project.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in Florida and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal floor plate stairs that are similar to those indicated for this Project in material, design, and extent

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C. Welding Qualifications: Qualify procedures and personnel including shop welders, field welders, welding operators and tacker sofr the following periods of effectiveness, according to the following:

1. Welding Standards:

   a. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   b. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
   c. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
   d. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

2. Certification and qualification, including period of effectiveness of welding personnel shall be as specified by AWS D1.1. Certification shall remain in effect for duration of work provided welders are continuously engaged in performing the type of welding for which they are certified, unless welders fail to perform acceptable welding, as determined by the Independent Special Inspection Agency . Certification and re-certification of welding personnel is subject to verification by the Testing Agency. Re-testing for re-certification will be the Contractor's responsibility.

D. Reference Standards: Except as governed by requirements of local building codes, provide metal pan stair in accordance with applicable requirements and recommendations of the following organizations and standards:

1. American Institute of Steel Construction (AISC): Code of Practice for Structural Steel Buildings, and Bridges". Where a conflict exists between the AISC Code of Standard Practice and the Contract Documents, the Contract Documents shall govern.
2. American Iron and Steel Institute (AISI) "Specification for the Design of Cold–Formed Steel Structural Members".
3. National Association of Architectural Metal Manufacturers (NAAMM):

   a. "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

      1) Decorative Stair: Architectural class

   b. "Metal Stairs Manual".
   c. "Pipe Railing Manual".
   d. "Metal Finishes Manual

4. Industrial Fasteners Institute (IFI): IFI "Fastener Standards".
5. Steel Structures Painting Council (SSPC): "Steel Structures Painting Manual, Volume 2, Systems and Specifications".

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Provide in place first installation mockup of one segment of each stair type with intermediate landing, and stringers, and railing specified. Include one run of stairs from post to post including handrail and bracket, steel railings and in fill, plus 4 complete treads.
2. Replace unsatisfactory work as directed until final acceptance by the Architect. Maintain accepted mock-ups throughout Project construction. Mock-up assemblies will be used as a standard for judging acceptability of Work on the Project.

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3. Subject to compliance with the requirements, approved mockups may become part of the completed work if undisturbed at time of substantial completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.

1. Keep members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.

    a. Repair or replace damaged materials or structures as directed.

4. Handle in such a manner so as to protect surfaces and to prevent distortion of, and any other type of damage to, fabricated pieces.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fabrication Engineering and Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to provide engineering of stairs, landings, and railings and guards, including attachment to building construction, using performance requirements and criteria indicated. Review the technical details of the decorative metal stairs and landings with respect to performance criteria, and engineer modifications or revisions to details of the stair and landings as well as the details for connections and members not specifically shown on the Drawings.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Steel: 72 percent of minimum yield strength.
2. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.
3. Stainless Steel: 60 percent of minimum yield strength.

C. Structural Performance of Stairs: Metal stairs withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Loads:

    a. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
    b. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
    c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.

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3. Deflection: Limit deflection of treads, platforms, and framing members to L/720 or 1/4 inch (6.4 mm), whichever is less Total load L/240. Global total defection of 3/4 inch for entire system.
4. Vibration: Limit frequency of entire system to min. vertical natural frequency of 5 Hz and a minimum lateral frequency of 2.5 Hz, in accordance with recommendations of the AISC Steel Construction Design Guide 11 "Vibrations of Steel-Framed Structural Systems Due to Human Activity", Section 2.3.

    a. Apply a 600 pound load vertically and limit deflection under this load to 1/8 in.
    b. Apply a 200 pound load laterally and limit deflection under this load to 1/8 inch.

5. Internal Pressure Loads: 5 psf internal pressure loading.
6. Camber: Camber for dead load of stair shall be used in order for stairs to be installed level..

D. Dynamic Coefficient of Friction: Provide finish to provide a minimum dynamic coefficient of friction. determined by testing identical products in accordance with ANSI A137.1 and A326.3 using the BOT-3000 to measure slip resistance of flooring, with the following minimum classification, reference category and performance:

1. Level Surfaces and Treads:

    a. Interior, Dry (ID): ≥0.42 dry DCOF.
    b. Interior, Wet (IW): > 0.42 wet DCOF.

2.2 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

1. Surface Flatness and Edges: For exposed Work provide materials which have been produced to the highest commercial standard for fire stairs and highest architectural standard for ornamental stairs for flatness with edges and corners sharp and true to angle or curvature as required.
2. Alloys and Tempers: Provide the specific alloy which will weld and machine properly, and will finish to match the Architect's sample. Use the temper or hardness which will provide the greatest strength and durability, consistent with necessary forming, fabrication and finishing processes.
3. Exposed Surfaces: For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [**25**]; percent.

C. Steel Tubing: ASTM A500/A500M (cold formed) or ASTM A513/A513M.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [**25**]; percent.

D. Stainless Steel Bars and Shapes: ASTM A276/A276M, [**Type 304**] [**Type 316L**].

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1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [**25**]; percent.

E. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M,[**either commercial steel, Type B, or**] structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [**25**]; percent.

F. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011/A1011M,[**either commercial steel, Type B, or**] structural steel, Grade 30 (Grade 205), unless another grade is required by design loads.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [**25**]; percent.

G. Galvanized-Steel Sheet: ASTM A653/A653M, G90 (Z275) coating,[**either commercial steel, Type B, or**] structural steel, Grade 33 (Grade 230), unless another grade is required by design loads.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [**25**]; percent.

H. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, [**Type 304**] [**Type 316**], stretcher-leveled standard of flatness.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [**25**]; percent.

I. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [**25**]; percent.

2.3 FASTENERS

A. General: Provide [**zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5**] [**Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5**] where built into exterior walls.

1. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for [exterior stairs] [stairs indicated to be galvanized] [stairs indicated to be shop primed with zinc-rich primer].

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D. Post-Installed Anchors: [**Torque-controlled expansion anchors**] [**or**] [**chemical anchors**] capable of sustaining, 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 E488/E488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy [**Group 1 (A1)**] [**Group 2 (A4)**] stainless steel bolts, ASTM F593, and nuts, ASTM F594 (ASTM F836M).

2.4 MISCELLANEOUS MATERIALS

A. VOC and Emissions Requirements: Paints and coatings, adhesives and sealants, wet applied on site shall comply with:

1. VOC limits (g/L) found in tables in Division 01 Section "Sustainable Design Requirements."

B. Welding Electrodes: Comply with AWS requirements.

C. Shop Primers: Provide primers that comply with [**Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."**] [**Section 099600 "High-Performance Coatings."**] [**Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."**]

D. Universal Shop Primer: 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.

E. Universal Field Primer: Provide LEED v4 compliant, GreenGuard Cold Certified universal field primer complying with MPI 107 X-Green, as follows:

1. "Pro-Cryl Universal Primer" (Sherwin Williams) with vocs of less than 50 g/l.

F. Zinc-Rich Primer: Complying with SSPC-Paint 20, [**Type I-A**] [**Type I-B**] [**Type I-C**] [**Type II**], Level [**1**] [**2**] [**3**], and compatible with topcoat.

G. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

H. Galvanizing Repair Paint: High-zinc-dust-content paint complying with [**SSPC-Paint 20**] [**ASTM A780/A780M**] and compatible with paints specified to be used over it.

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

J. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa) unless otherwise indicated.

K. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

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L. Plain Steel Welded-Wire Reinforcement: ASTM A1064/A10645M, [**steel,**] [**galvanized steel,**] 6 by 6 inches (152 by 152 mm), W1.4 by W1.4, unless otherwise indicated on Drawings.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [**25**]; percent.

M. Reinforcement Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.
2. For galvanized reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

N. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for [**interior**] [**exterior**] use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

2.5 PRECAST CONCRETE TREADS

A. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 5000 psi (35 MPa) and a total air content of not less than 4 percent or more than 6 percent.

B. Reinforcement: Galvanized, welded-wire reinforcement, 2 by 2 inches (50 by 50 mm) by 0.062-inch- (1.6-mm-) diameter steel wire; comply with ASTM A1064/A1064M, except for minimum wire size.

2.6 PRECAST TERRAZZO TREADS

A. Precast Terrazzo Stair Treads: Epoxy terrazzo units cast in maximum lengths possible. Comply with manufacturer's written instructions for fabricating precast terrazzo units in sizes and profiles indicated.

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

    a. Wausau Tile, Inc.; <**Insert product designation**>.

2. Epoxy Resin Matrix: Manufacturer's standard, recommended for use indicated.
3. Aggregates: Comply with NTMA gradation standards for mix indicated, and containing no deleterious or foreign matter.

    a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C131/C131M.
    b. 24-Hour Absorption Rate: Less than 0.75 percent.
    c. Dust Content: Less than 1.0 percent by weight.

4. Reinforcement: ASTM A615/A615M, Grade 60 (Grade 420) bars, as required by unit size, profile, and thickness.
5. Abrasive Inserts: 1/2-inch- (13-mm-) wide, alundum oxide/epoxy mixture.

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a. Provide three inserts, 1/2 inch (13 mm) apart, with first insert located 1 inch (25 mm) from nosing at adjacent stair riser locations.

6. Color: As selected from manufacturer's standard color selections.
7. Finish: Honed.
8. Surface Sealer: Slip and stain-resistant, penetrating sealer that is chemically neutral with pH factor between 7 and 12; does not affect color or physical properties of terrazzo type indicated; is recommend by sealer manufacturer for use with specified terrazzo; and complies with NTMA guide specification for terrazzo type applicable for this Project.

2.7 FABRICATION, GENERAL

A. Provide decorative metal stairs and platforms of the design shown. Comply with specified "Performance Criteria". Include supplementary parts necessary to complete architectural metal stair work though not definitely shown or specified.

B. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

C. Assemble stairs in shop to greatest extent possible.

1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.

D. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

E. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise shown. Miter exposed corner joints and machine fit to a hairline joint

F. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

G. Completely assemble and weld members before milling of surfaces.

H. Fabricate members with the natural camber pointing up. Provide shop–induced camber for members as indicated.

I. Assemble built–up sections by welding and make free of warpage with axes in true alignment.

J. Weld connections 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. Weld exposed corners and seams continuously unless otherwise indicated.

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5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 - No evidence of a welded joint.

K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.

1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
2. Locate joints where least conspicuous.

2.8 FABRICATION OF STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Architectural Class, unless more stringent requirements are indicated.

B. Stair Framing:

1. Stringers: Fabricate of [steel plates] [steel channels] [steel plates or channels] [steel tubes] [as indicated on Drawings].

a. Stringer Size: [**As required to comply with "Performance Requirements" Article**] [**As indicated on Drawings**].
b. Provide closures for exposed ends of [**channel**] [**tube**] stringers.
c. Finish: [**Shop primed**] [**Painted**] [**Galvanized**].

2. Platforms: Construct of steel [plate] [channel] [plate or channel] [rectangular tube] headers and miscellaneous framing members as [required to comply with "Performance Requirements" Article] [indicated on Drawings].

a. Provide closures for exposed ends of [**channel**] [**tube**] framing.
b. Finish: [**Shop primed**] [**Painted**] [**Galvanized**].

3. Weld[or bolt] stringers to headers; weld[or bolt] framing members to stringers and headers.[If using bolts, fabricate and join so bolts are not exposed on finished surfaces.]

C. Subtreads, Risers, and Subplatforms:

1. Fabricate subtreads and subplatforms of steel [**plates**] [**shapes indicated on Drawings**].
2. Form subtreads, risers, and subplatforms to configurations indicated from [uncoated, cold-rolled steel sheet] [uncoated, hot-rolled steel sheet] [galvanized steel sheet] [of thickness needed to comply with performance requirements, but not less than **0.075 inch (1.9 mm)** thick] [of thickness indicated on Drawings].
3. Weld subtreads to stringers.

a. Locate welds on top of subtreads where they will be concealed by finished treads.

4. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads.

a. Weld subplatforms to platform framing.
b. Locate welds on top of subplatforms where they will be concealed by finished flooring.
c. Smooth Soffit Construction: Construct subplatforms with flat metal under surfaces to produce smooth soffits.

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2.9 STAIR RAILINGS

A. Comply with applicable requirements in Section 057300 "Decorative Metal Railings."

1. Connect posts to stair framing by direct welding unless otherwise indicated.

2.10 FINISHES

A. Finish metal stairs after assembly.

B. Steel Galvanized Finish: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
2. Fill vent and drain holes that are exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

C. Steel Shop Prime Finish:

1. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with [**SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."**] [**SSPC-SP 3, "Power Tool Cleaning."**]
2. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting.

    a. Stripe paint corners, crevices, bolts, welds, and sharp edges.

D. Aluminum Finishes:

1. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.
2. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm] [AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.

    a. Color: [**Champagne**] [**Light bronze**] [**Medium bronze**] [**Dark bronze**] [**Black**] <**Insert color**>.

E. Stainless Steel Finishes:

1. Stainless Steel Tubing Finishes:

    a. 180-Grit Polished Finish: Uniform, directionally textured finish.
    b. 320-Grit Polished Finish: Oil-ground, uniform, fine, directionally textured finish.
    c. Polished and Buffed Finish: 320-grit finish followed by buffing [**to a high luster finish**] [**to a mirror-like finish**] [**to match Architect's sample**].

2. Stainless Steel Sheet and Plate Finishes:

    a. Directional Satin Finish: ASTM A480/A480M, No. 4.
    b. High Luster Finish: ASTM A480/A480M, No. 7.
    c. Mirror Finish: ASTM A480/A480M, No. 8.

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F. Bronze Finishes:

1. Statuary Conversion Coating over Satin Finish: CDA M31-C55 (Mechanical Finish: directionally textured, fine satin; Chemical Finish: conversion coating, sulfide)[**, with color matching Architect's sample**].
2. Statuary Conversion Coating over Satin Finish, Lacquered: CDA M31-C55-O6x (Mechanical Finish: directionally textured, fine satin; Chemical Finish: conversion coating, sulfide; Coating: clear, organic, air dried, as specified below)[**, with color matching Architect's sample**]:

    a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).

3. Hand-Rubbed Finish, Lacquered: CDA M31-M34-O6x (Mechanical Finish: directionally textured, fine satin; Mechanical Finish: directionally textured, hand rubbed; Coating: clear, organic, air dried, as specified below).

    a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).

G. Brass Finishes:

1. Buffed Finish, Lacquered: CDA M21-O6x (Mechanical Finish: buffed, smooth specular; Coating: clear, organic, air dried, as specified below).

    a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).

2. Hand-Rubbed Finish, Lacquered: CDA M31-M34-O6x (Mechanical Finish: directionally textured, fine satin; Mechanical Finish: directionally textured, hand rubbed; Coating: clear, organic, air dried, as specified below).

    a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).

H. Copper Finishes:

1. As Fabricated: CDA M12 (Matte finish as fabricated).
2. Buffed Finish: CDA M21 (Mechanical Finish: buffed, smooth specular).
3. Hand-Rubbed Finish: CDA M31-M34 (Mechanical Finish: directionally textured, fine satin; Mechanical Finish: directionally textured, hand rubbed).
4. Medium-Satin Finish: CDA M32 (Mechanical Finish: directionally textured, medium satin).
5. Fine-Matte Finish: CDA M42 (Mechanical Finish: nondirectional finish, fine matte).
6. Buffed Finish, Lacquered: CDA M21-O6x (Mechanical Finish: buffed, smooth specular; Coating: clear, organic, air dried, as specified below).

    a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).

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7. Hand-Rubbed Finish, Lacquered: CDA M31-M34-O6x (Mechanical Finish: directionally textured, fine satin; Mechanical Finish: directionally textured, hand rubbed; Coating: clear, organic, air dried, as specified below).

    a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).

8. Medium-Satin Finish, Lacquered: CDA M32-O6x (Mechanical Finish: directionally textured, medium satin; Coating: clear, organic, air dried, as specified below).

    a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).

9. Fine-Matte Finish, Lacquered: CDA M42-O6x (Mechanical Finish: nondirectional finish, fine matte; Coating: clear, organic, air dried, as specified below).

    a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings and conditions to which the stairs are to be attached and confirm that openings are square and in compliance with shop drawings and installation tolerances.

1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.
2. Notify Subcontractor if conditions are detrimental to the proper and expeditious installation of the work.
3. Starting the work shall indicate acceptance of the surfaces and conditions to perform the work as specified.

B. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare in place steel framing to receive stairs. If spray fireproofing is in place do not remove more than is necessary to accomplish the welded or bolted connections.

3.3 INSTALLING METAL STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.

1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

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B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates.

a. Clean bottom surface of plates.
b. Set plates for structural members on wedges, shims, or setting nuts.
c. Tighten anchor bolts after supported members have been positioned and plumbed.
d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.

1) Neatly finish exposed surfaces; protect grout and allow to cure.
2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

E. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
2. 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.
3. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

F. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."

1. Install abrasive nosings with anchors fully embedded in concrete.
2. Center nosings on tread width.

G. Install precast concrete treads with adhesive supplied by manufacturer.

H. Install precast terrazzo treads according to manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: The [**Owner**][**Design Builder**]shall engage a qualified Welding Inspector to perform the following special inspections:

1. Inspect the decorative metal stair steel fabrication for welding as Work progresses in accordance with [**IBC Chapter 17**] [**NYBC Table 1705.2**] as applicable to steel floor plate stair construction. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Architect/Engineer for final acceptance.

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a. Field inspection of steel shall include connections, levelness, plumbness and alignment of the stair and railing systems in conformance with AWS welding methods, examination of surface before welding, examination and testing of completed welds.

2. If testing finds welds are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.
3. Welds will be considered defective if they do not pass tests and inspections.

   a. Remove and replace welds that does not pass tests and inspections, and retest.
   b. Additional testing and inspecting, [**beyond a follow up inspection**]shall be at [**Contractor's**] [**Subcontractor's**]expense, will be performed to determine compliance of replaced or additional work with specified requirements.

4. Railing Testing: If installation of railings in not in compliance with approved shop drawings and calculations, stair and railing Subcontractor shall test railings in the presence of the special inspector in accordance with ASTM E894 and ASTM E935 to verify compliance with railing performance requirements and to validate fabrication engineering**.**
5. Prepare test and inspection reports and submit to the [**Owner,]**[**Design Builder,]**Architect**[, and DDC/AHJV**].

3.5 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with LEED v4 compliant primer compatible with shop primer to comply with SSPC-PA 1 for touching up shop-painted surfaces.
2. Paints and coatings shall comply with VOC limits found in Division 01 Section "Sustainable Design requirements" and emissions criteria meeting CDPH Standard Method v1.2

   a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

3. The maximum allowable VOC content for field applied anti-corrosive touch-up paint shall be 250 grams/liter.
4. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in [Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."] [Section 099600 "High-Performance Coatings."] [Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."]

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

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SECTION 057313 - GLAZED DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Interior structural glass railings.

C. Related Requirements:

1. Division 05 Section "Structural Steel" for structural steel supports.
2. Division 05 Section “Decorative Metal Stairs.”
3. Division 05 Section “Pipe and Tube Railings” for handrails and brackets.

1.2 DEFINITIONS

A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.3 COORDINATION AND SCHEDULING

A. Do not install enclosing or concealing construction until after welds have been inspected and tested and corrections have been made to defective applications.

B. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

C. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

D. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not suit structural performance requirements.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Metal railings assembled from standard components.
2. Glass products.

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3. Glazing cement and accessories for structural glass railings.
4. Sealant and accessories for structural glass railings.
5. Fasteners.
6. Shop primer.
7. Bituminous paint.
8. Nonshrink, nonmetallic grout.
9. Anchoring cement.

B. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:

a. Leadership Extraction Practices:

1) Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
2) Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.

a) Include statement indicating costs for each product having recycled content.

b. Sourcing of Raw Materials: For products that are sustainably sourced within 100 miles of project site, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.

2. Indoor Environmental Quality, Low Emitting Materials:

a. Laboratory Test Reports: For adhesives, sealants, paints, coatings wet applied on site, indicating testing and compliance with the California Department of Public-Health (CDPH) Standard Method V1.2-2017, using the applicable exposure scenario.
b. Paints, and Coatings: For wet applied on site products, include printed statement of VOC content, showing compliance with the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016.
c. Adhesives and Sealants: For wet applied on site products, submit printed statement showing compliance with the applicable chemical content requirements of SCAQMD Rule 1168, effective July 1, 2005 and rule amendment date of October 6, 2017.

C. Shop Drawings: Include plans, elevations, sections, and attachment details. Provide dimensioned drawings of assemblies, indicating hardware locations, transitions, and terminations to adjacent railings.

D. Samples for Verification: For each type of exposed finish required.

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1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Base channel.
3. Glass baluster cap.
4. Each type of glass and glass edge required.
5. Fittings and brackets, including samples of design fabrication rail brackets and guard brackets.
6. Finishes.
7. Assembled Samples of railing systems, made from full-size components, including top (cap) rail, post, handrail, and structural glass balusters. Show method of finishing members at intersections. Samples need not be full height.

E. Fabrication Engineering and Design: For installed products indicated to comply with performance requirements and criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Fabrication Engineering and Design: For installed products indicated to comply with performance requirements and criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Environmental Product Declarations:

a. Submit product specific type III EPDs or Industry wide (generic) EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Building Product Disclosure and Optimization - Material Ingredients:

a. Material Ingredient Optimization: Submit at least one of the following:

1) GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
2) Cradle to Cradle: Manufacturer's published literature for the product bearing the Cradle to Cradle logo, with gold or platinum certification.
3) International Alternative Compliance Path - REACH Optimization.
4) Declare: Manufacturer's completed Product Declaration Form.
5) Other programs approved by USGBC.

D. Mill Certificates: Signed by manufacturers of stainless steel products, certifying that products furnished comply with requirements.

E. Welding Certificates and Procedures: Submit for record written data on the materials, welding procedures and qualifications of welders in accordance with requirements of AWS D1.1 and the Building Code. For stainless steel welds or bimetallic welds between stainless and carbon steels, submit for review welding procedures and processes per AWS D1.6 requirements. Submit all welding and qualification procedures to the Special Inspection Agency for approval before submitting to the Design Professionals.

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F. Product Test Reports: For tests performed by a qualified testing agency, in accordance with ASTM E894, ASTM E935, ASTM E2353, and ASTM E2358.

G. Shop and field quality-control reports and inspection reports.

H. Evaluation Reports: From ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1. For glazed decorative metal railings.
2. For post-installed anchors.

I. Preconstruction test reports.

1.7 QUALITY ASSURANCE

A. Professional Engineer, Qualifications: A professional engineer who is licensed to practice in the 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 glazed decorative metal railings that are similar to those indicated for this Project in material, design and extent.

B. Welding Qualifications: Qualify the welding procedures and personnel including shop welders, field welders, welding operators and tackers for the following periods of effectiveness according to the following:

1. Welding Reference Standards:

a. AWS D1.1, "Structural Welding Code--Steel."
b. AWS D1.2, "Structural Welding Code - Aluminum."
c. AWS D1.6, "Structural Welding Code - Stainless Steel."

2. Certification and qualification, including period of effectiveness of welding personnel shall be as specified by AWS D1.1. Certification shall remain in effect for duration of work provided welders are continuously engaged in performing the type of welding for which they are certified, unless welders fail to perform acceptable welding, as determined by the Independent Special Inspection Agency. Certification and re-certification of welding personnel is subject to verification by the Testing Agency. Re-testing for re-certification will be the Subcontractor's responsibility.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups as indicated on Drawings.
2. Build mockups for each form and finish of structural glass railing consisting of top (cap) rail, structural glass, base channel, and anchorage system components that are full height and are not less than 24 inches (600 mm) in length.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Laminated Glass: Glazed decorative metal railing manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide products of one of the following:

1. Architectural Metal Works.
2. C.R. Laurence Co., Inc.
3. Livers Bronze Co.
4. R & B Wagner, Inc.
5. VIVA Railings, LLC.

B. Source Limitations for Laminated Glass: Obtain from single source from single manufacturer.

C. Source Limitations for Decorative Metal Railing Components: Obtain from single source from single manufacturer for each component and installation method.

D. Product Options: Information on Drawings and in the Specifications establishes requirements for railing system's 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.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

2.2 PERFORMANCE REQUIREMENTS

A. Fabrication Engineering and Design: Engage a qualified professional engineer, licensed to practice in the State of the Project, as defined in Section 014000 "Quality Requirements," to engineer glazed decorative metal railings, including attachment to building construction.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

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1. Aluminum: The lesser of minimum yield strength divided by 1.65, or minimum ultimate tensile strength divided by 1.95.
2. Stainless Steel: 60 percent of minimum yield strength.
3. Steel: 72 percent of minimum yield strength.

C. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

   a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction at the top and to transfer load through supports to structure.
   b. Concentrated load of 200 lbf (0.89 kN) applied in any direction at any point and have supporting structure to transfer this loading to appropriate structural elements of the building.
   c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Structural Glass Railings:

   a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m) and a concentrated upward load of 50 lbs. applied at the most critical location.

3. Structural Glass Railings: Support each section of top rail and handrail by a minimum of three glass panels or by other means so railings will remain in place if any one glass panel fails.

   a. Support handrail ends such that railings remains in place if end glass panel fails.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

2.3 METALS, GENERAL

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

B. Recycled Content: Provide steel products with an average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

C. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

2.4 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.

B. Extruded Bars and Shapes, Including Extruded Tubing: ASTM B221 (ASTM B221M), Alloy 6063-T5/T52.

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C. Extruded Structural Pipe and Round Tubing: ASTM B429/B429M, Alloy 6063-T6.

1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.

D. Drawn Seamless Tubing: ASTM B210 (ASTM B210M), Alloy 6063-T832.

E. Plate and Sheet: ASTM B209 (ASTM B209M), Alloy 6061-T6.

F. Die and Hand Forgings: ASTM B247 (ASTM B247M), Alloy 6061-T6.

G. Castings: ASTM B26/B26M, Alloy A356.0-T6.

2.5 STAINLESS STEEL

A. Tubing: ASTM A554, Grade MT 304 for interior railings.

B. Pipe: ASTM A312/A312M, Grade TP 304 for interior railings.

C. Castings: ASTM A743/A743M, Grade CF 8 or Grade CF 20 for interior railings.

D. Sheet, Strip, Plate, and Flat Bar: ASTM A666 or ASTM A240/A240M, Type 304 for interior railings.

E. Bars and Shapes: ASTM A276, Type 304 for interior.

2.6 STEEL AND IRON

A. Tubing: ASTM A500/A500M (cold formed) or ASTM A513/A513M.

B. Bars: Hot-rolled, carbon steel complying with ASTM A29/A29M, Grade 1010.

2.7 GLASS GUARDRAILS

A. Laminated Glass Guardrail Balusters: ASTM C1172, Type II with two plies of glass bonded together by an interlayer.

1. Type: 1/2-inch nominal thickness laminated glass units.

a. Outer Pane: 6mm clear glass.
b. Interlayer: 0.060 inch thick SentryGlas.
c. Inner Pane: 6mm clear glass.

B. Base Channels (Shoes): Manufacturer's standard stainless steel units, with glazing pocket sized for glass thickness required to meet performance requirements.

1. Finish: No. 4.

C. Top (Cap) Rails: Manufacturer's standard U-shape unit sized for glass thickness required to meet performance requirements.

1. Finish: No. 6.

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2.8 FASTENERS

A. Fastener Materials: Use fasteners of same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined. Unless otherwise indicated, provide the following:

1. Aluminum Components: Type 304 for stainless steel fasteners.
2. Stainless Steel Components: Type 304 for stainless steel fasteners.
3. Dissimilar Metals: Type 304 for stainless steel fasteners.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless exposed fasteners are unavoidable.

1. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/ASTM F1941M, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Stainless Steel: Alloy Group 1 (A1) stainless steel bolts, ASTM F593, and nuts; ASTM F594 (ASTM F836M).

2.9 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum railings, 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. Handrail Brackets: As indicated on Drawings for material and center of rail from face of structural glass.

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

a. Blum, Julius & Co., Inc.
b. The Wagner Companies., R&B Wagner, Inc.

C. Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M, type I or II.

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E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior applications.

F. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

2.10 FABRICATION OF METAL RAILINGS

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

B. Assemble railings in the 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. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

F. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NAAMM's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.

G. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

H. Form changes in direction as follows:

1. As detailed.
2. By bending to smallest radius that will not result in distortion of railing member.

I. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

J. Close exposed ends of hollow railing members with prefabricated end fittings.

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K. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch or less.

L. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, handrail brackets, miscellaneous fittings, and anchors to interconnect railing members to other work where indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

N. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

1. Coordinate with cast-in-place concrete work to provide embed plates for installation by the concrete contractor.

2.11 FABRICATION OF GLASS PANELS AND BALUSTERS

A. General: Fabricate glass to sizes and shapes required; provide for proper edge clearance and bite on glazing panels.

B. Structural Glass Balusters: Provide laminated, tempered structural glass balusters for both straight and curved sections.

1. Edge Finish: Edges of glass indicated to be exposed in the finish work, shall be in full alignments, with zero mismatch, zero tolerance and full alignment.

a. Ground smooth and polish edges of laminated glass to be butt glazed. Ground smooth and slightly chamfer glass edges at edges to be concealed in the finish work.

2. Fabricate structural glass balusters to maintain equal length glass widths and uniform spacing of 1/2 inch (13 mm) between glass balusters.

2.12 METAL FINISH REQUIREMENTS, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. 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.

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D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.13 ALUMINUM FINISHES

A. Mechanical Finish: AA-M3x; sand top rails, handrails, and intermediate rails in one direction only, parallel to length of railing, with 120- and 320-grit abrasive. After installation, polish railings with No. 0 steel wool immersed in paste wax, then rub to a luster with a soft dry cloth.

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

C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: Match Architect's sample.

2.14 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

C. Stainless Steel Tubing Finishes:

1. 180-Grit Polished Finish: Uniform, directionally textured finish.
2. 320-Grit Polished Finish: Oil-ground, uniform, fine, directionally textured finish.
3. Polished and Buffed Finish: 320-grit finish followed by buffing to match Architect's sample.

D. Stainless Steel Sheet, Strip, Plate, and Bar Finishes:

1. Directional Satin Finish: ASTM A480/A480M, No. 4.
2. Mirror Finish: ASTM A480/A480M, No. 8.

2.1 SOURCE QUALITY CONTROL

A. Pending receipt of welding procedures in Paragraph "Information Submittals", provide periodic shop inspection including but not limited to alignment and straightness of members, preparation for connections, dimensional checks, witnessing of welding procedures, examination, and testing of completed welds, cleaning, painting and storage of material. All shop fabrication shall be inspected in the shop.

1. Welding:

a. Full penetration welds: Test all full penetration welds for soundness by means of either radiographic or ultrasonic testing in accordance with AWS D1.1 and ASTM E164 procedures. Repair all flaws in plate or flange material revealed during such tests.

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b. Partial penetration welds: Test all partial penetration welds for soundness by means of visual and magnetic particle inspection, unless other methods are specified in the Contract Documents. Repair all flaws in plate or flange material revealed during such tests.

c. Fillet welds: Visually inspect all fillet welds by AWS certified welding inspector. In addition, test ten percent (10%) of all fillet welds using a non-destructive method, such as dye penetrant or magnetic particle. Select test locations randomly throughout the structure, but test at least one weld in each location with 6 or more welds per connection. If, in the opinion of the independent Inspector this testing discloses a large ratio (10% or more) of unacceptable welds, the required percentage of tested welds may be increased to 100%, all at the contractor's expense. All defects found visually in fillet welds shall be non-destructively tested by magnetic particle or dye-penetrant methods

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Comply with Drawings and manufacturer's written instructions for installing glazed decorative metal railings, accessories, and other components.

B. Perform cutting, drilling, and fitting required for installing metal railings.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line, without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
4. Do not weld, cut, or abrade surfaces of metal railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
5. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, or dissimilar metals, with bituminous paint.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints. Comply with the following tolerances:

1. Panel to Panel Joint Alignment: maximum 1/16 inch vertically, and maximum 1/8 inch out of plane.
2. Plumb: 1/8 inch in 10 ft., 1/4 inch in 40 ft.

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3. Level: 1/8 inch in 20 ft., 1/4 inch in 40 ft.
4. Location: Limit variation from plane to 1/8 inch in 12 ft.; 1/4 inch overall.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 METAL RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Nonwelded Connections:

1. Use mechanical or adhesive joints for permanently connecting railing components.
2. Use wood blocks and padding to prevent damage to railing members and fittings.
3. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

C. Expansion Joints: Install expansion joints at locations indicated, but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING RAILING ENDS

A. Anchor railing ends to concrete and masonry with brackets on underside of rails connected to railing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

3.5 ATTACHING HANDRAILS TO WALLS

A. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.

B. Attach handrails to walls with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to supporting construction as indicated on Drawings or required by application conditions:

3.6 INSTALLATION OF GLASS BALUSTERS

A. Structural Glass Railings:

1. Install assembly to comply with railing manufacturer's written instructions.
2. Attach base channel to building structure, then insert and connect factory-fabricated and -assembled glass balusters if glass was bonded to base and top-rail channels in factory.
3. For field-assembled balusters, attach base channel to building structure, insert glass in base channel, and bond with sealant.

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a. Support glass balusters in base channel at quarter points with channel-shaped setting blocks that also act as shims to maintain uniform space for glazing cement.
b. Fill remaining space in base channel with sealant for uniform support of glass.

4. Adjust spacing of glass balusters so gaps between balusters are equal before securing in position.
5. Erect glass railings under direct supervision of manufacturer's authorized technical personnel.

3.7 CLEANING

A. Clean aluminum and stainless steel by washing thoroughly with water and soap, rinsing with clean water, and wiping dry.

B. Clean and polish glass as recommended in writing by manufacturer. Wash both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion.

3.8 PROTECTION

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

B. 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.

END OF SECTION 057313

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SECTION 057500 - DECORATIVE FORMED METAL

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Closures and trim.
2. Filler panels.

C. Related Requirements:

1. Division 05 Section "Decorative Metal" for decorative items made primarily from plate, bars, extrusions, tubes, castings, and other forms of metal, but which may include sheet metal components.

1.2 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 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 age, corrosion, and other causes of deterioration.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including finishing materials.

B. Sustainable Design Submittals:

1. Building Product Disclosure and Optimizati0n - Sourcing of Raw Materials:

a. Leadership Extraction Practices:

1) Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
2) Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.

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a) Include statement indicating costs for each product having recycled content.

2. Indoor Environmental Quality, Low Emitting Materials:

a. Laboratory Test Reports: For adhesives, sealants, paints, coatings wet applied on site, indicating testing and compliance with the California Department of Public-Health (CDPH) Standard Method V1.2-2017, using the applicable exposure scenario.
b. Paints, and Coatings: For wet applied on site products, include printed statement of VOC content, showing compliance with the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016.
c. Adhesives and Sealants: For wet applied on site products, submit printed statement showing compliance with the applicable chemical content requirements of SCAQMD Rule 1168, effective July 1, 2005, and rule amendment date of October 6, 2017.
d. Alternative tests for VOC above include ASTM D2369-10; ISO 11890 part 1; ASTM D6886-03; or ISO 11890-2.
e. Methylene Chloride and perchloroethylene may not be added to paints, coating, adhesive or sealants.

C. Shop Drawings: Show fabrication and installation details for decorative formed metal.

1. Include plans, elevations, sections, and component details, and attachment details.
2. Indicate materials and profiles of each decorative formed metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.
3. Show dimensions of housed items, including locations of housing penetrations and attachments, and necessary clearance
4. Provide templates for anchors and bolts specified for installation in other Sections.

D. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

E. 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.

1.5 INFORMATIONAL SUBMITTALS

A. 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.

B. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Environmental Product Declarations:

a. Submit product specific type III EPDs or Industry wide (generic) EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Building Product Disclosure and Optimization - Material Ingredients:

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a. Material Ingredient Optimization: Submit at least one of the following:

1) GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
2) Cradle to Cradle: Manufacturer's published literature for the product bearing the Cradle to Cradle logo, with gold or platinum certification.
3) International Alternative Compliance Path - REACH Optimization.
4) Declare: Manufacturer's completed Product Declaration Form.
5) Other programs approved by USGBC.

C. Qualification Data: For Installer fabricator.

D. Mill Certificates: Signed by stainless-steel manufacturers certifying that products furnished comply with requirements.

E. Welding certificates.

F. Evaluation Reports: For post-installed anchors, from ICC-ES.

G. Fabrication Engineering 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.

1.6 CLOSEOUT SUBMITTALS

A. Operations and Maintenance Data: For metal finishes to include in maintenance manuals.

1.7 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.

1. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Organic-Coating Applicator Qualifications: A firm experienced in successfully applying organic coatings of type indicated to metals of types indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.

C. Anodic Finisher Qualifications: A firm experienced in successfully applying anodic finishes of type indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.

D. Powder-Coating Applicator Qualifications: A firm experienced in successfully applying powder coatings of type indicated to metals of types indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.

E. Installer Qualifications: Fabricator of products.

F. Welding: Qualify procedures and personnel according to the following:

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1. AWS D1.1, "Structural Welding Code - Steel."
2. AWS D1.2, "Structural Welding Code - Aluminum."
3. AWS D1.3, "Structural Welding Code - Sheet Steel."
4. AWS D1.6, "Structural Welding Code - Stainless Steel."

G. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups for the following types of decorative formed metal:

a. One mockup of each item specified in this section.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 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.

1.9 FIELD 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.

PART 2 - PRODUCTS

2.1 SHEET METAL

A. General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal exposed to view in the completed Work, fabricate products from sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Steel Sheet: Electrolytic zinc-coated, ASTM A879/A879M, with steel sheet substrate complying with ASTM A1008/A1008M, commercial steel, exposed.

2.2 MISCELLANEOUS MATERIALS

A. VOC and Emissions Requirements: Adhesives and sealants, wet applied on site shall comply with:

1. VOC limits (g/L) found in tables in Division 01 Section "Sustainable Design Requirements."

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2. Emissions testing criteria of CHPH Standard v1.2-2017.

B. Gaskets: As required to seal joints in decorative formed metal and remain airtight; as recommended in writing by decorative formed metal manufacturer.

1. ASTM D1056, 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.

C. Sealants, Interior: Nonsag, paintable sealant complying with Division 07 Section "Joint Sealants" and as recommended in writing by decorative formed metal manufacturer.

D. 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.

E. 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 exposed fasteners are unavoidable or are the standard fastening method.
2. Provide square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.

F. Structural Anchor: For applications indicated to comply with certain design loads, provide torque controlled expansion anchors with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.

G. Nonstructural Anchors: For applications not indicated to comply with design loads, provide fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.

H. Anchor Materials:

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.

I. Sound-Deadening Materials:

1. Insulation: Unfaced, mineral-fiber blanket insulation complying with ASTM C665, Type I, and passing ASTM E136 test.
2. Mastic: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

J. Backing Materials: Provided or recommended by decorative formed metal manufacturer.

K. Laminating Adhesive: Adhesive recommended by metal fabricator that will fully bond metal to metal, will prevent telegraphing and oil-canning, and is compatible with substrate and noncombustible after curing.

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1. Contact Adhesive: VOC content of not more than 80 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).
2. Metal-to-metal Adhesive: VOC content of not more than 30 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).
3. Multi-Purpose Construction Adhesive: VOC content of not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).
4. Special-Purpose Contact Adhesive (contact adhesive used to bond melamine-covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, and rubber or wood veneer, 1/16 inch or less in thickness, to any surface): 250 g/L.

L. Isolation Coating: Manufacturer's standard bituminous paint specially formulated to provide dielectric separation and prevent galvanic action between dissimilar metals..

2.3 PAINTS AND COATINGS

A. VOC and Emissions Requirements: Adhesives and sealants, wet applied on site shall comply with:

1. VOC limits (g/L) found in tables in Division 01 Section "Sustainable Design Requirements."
2. Emissions testing criteria of CHPH Standard v1.2-2017.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Shop Primers: Comply with Division 09 Section "Painting."

E. 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.

F. Universal Field Primer: Provide LEED v4 compliant, GreenGuard Cold Certified universal field primer complying with MPI 107 X-Green, as follows:

1. "Pro-Cryl Universal Primer" (Sherwin Williams) with VOC of less than 50 g/l.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

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

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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.

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. Where 90 degree bends are indicated, back cut panels to provide the tightest bends possible without cracking or crazing edges.

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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fry Reglet Corporation.
2. Gordon, Inc.
3. Pittcon Industries.

B. Extruded Closures and Trim:

1. Wall Reveals and Trim for Application at Gypsum Board: Extruded aluminum shapes with integral tapered fins for contact with gypsum board.

a. Material: 6063 aluminum alloy, with T5 temper.
b. Finish: Factory primed.

2. Reveal and Trim for Application at Architectural Woodwork: Extruded aluminum shapes.

a. Material: 6063 aluminum alloy, with T5 temper.
b. Finish: Factory primed.

C. Form closures and trim from metal of type and thickness indicated below. Fabricate to fit tightly to adjoining construction.

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1. Aluminum Sheet: 0.125 inch, minimum, with thickness required to comply with performance requirements.

    a. Finish: As indicated on Drawings for each application.

2. Galvanized-Steel Sheet: Thickness required to comply with performance requirements.

    a. Finish: Siliconized polyester.

3. Closures and trim may be fabricated from prefinished metal sheet in lieu of finishing after fabrication provided unfinished edges are concealed from view.

D. 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.

E. Drill and tap holes needed for securing closures and trim to other surfaces.

F. Incorporate gaskets where indicated or needed for concealed, continuous seal at abutting surfaces.

G. Miter or cope trim members at corners and reinforce with bent metal splice plates to form tight joints.

2.6 FILLER PANELS

A. Form filler panels for closing ends of partition systems and for other applications indicated. Form from two sheets of metal of type and thickness indicated below, separated by channels formed from the same material, producing a panel of same thickness as adjacent construction unless otherwise indicated. Incorporate reveals, trim, and concealed anchorages for attaching to adjacent surfaces.

1. Galvanized-Steel Sheet: 0.064 inch.

    a. Finish: Siliconized polyester.

2. Filler panels may be fabricated from prefinished metal sheet in lieu of finishing after fabrication provided unfinished edges are concealed from view.

B. Fill interior of panel with sound-deadening insulation permanently attached to inside panel faces.

C. Adhesively attach gaskets to filler panel edges where they abut mullions or glazing. Use 1-inch-square material, unless otherwise indicated, set approximately 1/4 inch into channeled edge of filler panel.

D. Attach gaskets to all edges of panels that abut adjacent surfaces to form a continuous seal. Use compressible gaskets or mastic sealing tape, applied to center of panel edges to be concealed from view, unless otherwise indicated.

E. Do not mechanically fasten filler panels to mullions.

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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. Finish items indicated on Drawings after assembly.

F. 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 GALVANIZED-STEEL SHEET FINISHES

A. Preparing Galvanized Items for Factory Priming: Thoroughly clean galvanized decorative formed metal of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

B. Preparing Galvanized Items for Factory Finishing: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

C. Repairing Galvanized Surfaces: Clean welds and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

D. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply shop primer to prepared surfaces of items unless otherwise indicated. Use LEED v4 compliant universal field primer with VOC limits found in Division 01 Section "Sustainable Design Requirements" and emissions criteria meeting CDPH Standard Method v1.2. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

E. Siliconized-Polyester Coating: Immediately after cleaning and pretreating, apply manufacturer's standard epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.

1. Color and Gloss MTL-xx: Match Architect's sample.

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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.

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, sealants, and insulation, as the Work progresses, to make interior decorative formed metal items soundproof or lightproof as applicable to type of fabrication indicated.

E. 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.

F. Install decorative-formed-metal-clad doors and frames to comply with requirements specified in Division 08 Section "Hollow Metal Doors and Frames."

3.3 ADJUSTING AND CLEANING

A. Unless otherwise indicated, clean metals by washing thoroughly with water and soap, rinsing with clean water, and drying with soft cloths.

B. Clean copper alloys according to metal finisher's written instructions in a manner that leaves an undamaged and uniform finish matching approved Sample.

C. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with LEED v4 compliant universal field primer compatible with primer used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Paints and coatings shall comply with VOC limits found in Division 01 Section "Sustainable Design requirements" and emissions criteria meeting CDPH Standard Method v1.2.
2. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

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D. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 Section "Painting"

E. 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

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SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Rooftop equipment bases and support curbs.
2. Wood blocking and nailers.
3. Plywood backing panels.

C. Related Requirements:

1. Division 06 Section “Sheathing.”

1.2 DEFINITIONS

A. Miscellaneous Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.

B. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.

C. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater size but less than 5 inches nominal (114 mm actual) size in least dimension.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
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.

B. Sustainable Design Submittals:

1. Product Data: For adhesives and sealants, indicating VOC content.
2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

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1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.2

B. Sustainability Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
3. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation.

B. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

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. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less, 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

C. Low-Emitting Materials:

1. Adhesives and Sealants wet-applied on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. All adhesives and sealants wet-applied onsite must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4/v4.1 BD+C: New Construction”.

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2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood blocking, stripping, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

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

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated. Provide one of the following:

    a. FRX; Lonza
    b. Exterior Fire X; Hoover Treated Wood Products

3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated. Provide one of the following:

    a. D-Blaze; Viance.
    b. Dricon; Lonza.
    c. Pyro-guard; Hoover Treated Wood Products, Inc.

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C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat items indicated on Drawings, and the following:

1. Concealed blocking.
2. Plywood backing panels.

2.4 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. Grounds.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

1. Mixed southern pine or southern pine; SPIB.
2. Spruce-pine-fir; NLGA.
3. Hem-fir; WCLIB or WWPA.
4. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Concealed Boards: 15 percent maximum moisture content of any of the following species and grades:

1. Mixed southern pine or southern pine, No. 3 grade; SPIB.
2. Spruce-pine-fir (south) or spruce-pine-fir, Standard or No. 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

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.

2.5 PLYWOOD BACKING PANELS

A. General: Sheet products with graded face plies meeting DOC PS1 and US Product Standards PS 1-09. Provide sanded plywood.

1. Bond Classification: “Exterior” for all plywood used at exterior or in exterior wall; “Exposure 1” for all other plywood.
2. Core: Provide veneer core with no voids for electrical and communications backing boards.
3. Performance category value used as the nominal panel thickness.

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4. Provide APA trademark and grading edgemarks and backstamps for all pieces. Provide stamp in location as required by authority having jurisdiction.

B. Communications and Electrical Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

C. Mirrored Glass 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 thick.

D. Plywood Wall Protection Panels: DOC PS 1, A-C, Group 1, Exterior, touch sanded, fire retardant treated in thicknesses 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 A153/A153M.

B. Nails, Brads, and Staples: ASTM F1667.

C. Screws for Fastening to Metal Framing: ASTM C1002 or ASTM C954 as appropriate, length as recommended by screw manufacturer for material being fastened.

D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC193 as appropriate for the substrate.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2 (ASTM F738M and ASTM F836M, Grade A1 or A4).

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

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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 accurately to other construction. Locate nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

C. 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 (406 mm) o.c.

D. 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 (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.

E. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

F. 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.

G. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

H. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILER

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

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C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) 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 wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

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

END OF SECTION 061053

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SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Wall sheathing.
2. Sheathing joint-and-penetration treatment.

C. Related Requirements:

1. Division 07 Section "Air Barriers" for sheathing joint and penetration treatment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

B. Shop Drawings: For air-barrier and water-resistant glass-mat gypsum sheathing assemblies.

1. Show locations and extent of sheathing, accessories, and assemblies specific to Project conditions.
2. Include details for sheathing joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

C. Sustainable Design Submittals:

1. Product Data: All adhesives, sealants, paints and coatings wet-applied onsite, indicating VOC content.
2. Laboratory Test Reports: All adhesives, sealants, paints and coatings wet-applied onsite, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For ceiling materials, indicating compliance with requirements for low-emitting materials.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer. including list of ABAA-certified installers and supervisors employed by Installer, who work on Project and testing and inspecting agency.

B. Product Certificates: From air-barrier and water-resistant glass-mat gypsum sheathing manufacturer, certifying compatibility of sheathing accessory materials with Project materials that connect to or that come in contact with the sheathing.

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C. Product Test Reports: For each air-barrier and water-resistant glass-mat gypsum sheathing assembly, indicating compliance with specified requirements, for tests performed by a qualified testing agency.

D. Evaluation Reports: For the following, from ICC-ES:

E. Field quality-control reports.

F. Sustainability Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
3. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

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 E119 by a qualified testing and inspecting agency acceptable to the Fire Marshal.

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 WALL SHEATHING

A. Gypsum Wall Sheathing: ASTM C1177/C1177M.

B. Manufacturers and Product in compliance with requirements include:

1. Basis of Design Product: G-P Gypsum Corporation; Dens-Glass Gold.

C. Acceptable manufacturers: Subject to compliance with requirements, manufacturers and products that may be incorporated into the Work include:

1. “Securock; USG.
2. “GlasRoc Exterior Sheathing”, CertainTeed.
3. “Weather Defense Platinum Sheathing”, fiberglass faced gypsum sheathing, Continental Building Products.

D. Type: Type X (fire rated) where indicated.

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E. Thickness: As indicated.

F. Low-Emitting Materials:

1. For ceiling assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the CDPH Standard Method v1.2.
2. All adhesives, sealants, paints and coatings wet-applied onsite must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
3. All adhesives, sealants, paints and coatings wet-applied onsite must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4/v4.1 BD+C: New Construction".

2.2 FASTENERS

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

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. 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 B117.

1. For steel framing less than 0.0329-inch thick, attach sheathing to comply with ASTM C1002.
2. For steel framing from 0.033 to 0.112-inch thick, attach sheathing to comply with ASTM C954.

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. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.

D. 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.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

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F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 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.

D. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

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SECTION 064000 - ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Architectural wood veneer faced cabinets.
2. Plastic-laminate faced cabinets.
3. Flush wood veneer paneling.
4. Solid surfacing paneling.
5. Solid surfacing paneling with custom routed design.
6. Interior standing and running trim.
7. Banquettes.
8. Interior millwork.
9. Shelving.
10. Decorative metals.
11. Shop finishing interior woodwork.
12. Cabinet hardware and accessories.
13. Furring, blocking, shims, hanging strips, unless concealed within other construction before woodwork installation.

C. Related Requirements:

1. Division 05 Section "Metal Fabrications" for miscellaneous metal required to support architectural woodwork.
2. Division 06 Section "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips concealed within other construction but required for woodwork installation.
3. Division 07 Section "Joint Sealants."
4. Division 12 Section “Quartz Agglomerate Countertops.”
5. Division 12 Section “Solid Surfacing Countertops.”

1.2 DEFINITIONS

A. Architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, that are not concealed within other construction before woodwork installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

B. Prior to commencing work of this Section, arrange pre-installation conference to be attended by the Owner, Architect, architectural woodwork Manufacturer, architectural woodwork Installer, and installers whose work interfaces with or affects architectural woodwork.

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C. Pre-installation conference agenda shall include but not limited to; methods and procedures for installing architectural woodwork, interfaces with adjacent work of other Sections, conditions under which the work of this Section will be done, inspection of surfaces and substrates to receive architectural woodwork as indicated in order that alternate recommendations may be made should adverse conditions exist.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including but not limited to hardboard, medium-density fiberboard, plywood, high-pressure decorative laminate, adhesive for bonding plastic laminate, solid-surfacing material, fire-retardant-treated materials, cabinet hardware and accessories, and finishing materials and processes.

1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
2. Certification of compliance with the environmental performance requirements specified in this Section.

B. Sustainable Design Submittals:

1. Product Data: For adhesives and sealants, indicating VOC content.
2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Submit shop drawings of architectural woodwork for the fabrication and the installation of the Work. Include large scale details, dimensioned plans and elevations, and adjacent work of other trades. Shop drawings will not be reviewed until AWI Quality Certification Program letter of accreditation has been submitted

1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
2. Show locations and sizes of furring, blocking, and hanging strips, including required concealed blocking and reinforcement specified in other Sections.
3. Indicate room numbers, materials, thicknesses and finishes.
4. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, electrical switches and outlets, and other items installed in architectural woodwork and paneling.
5. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
6. Show jointing, joint treatment and butt jointing in veneers and plastic laminate.
7. Show complete elevations of rooms to receive paneling as well as panel matching required by these specifications.
8. For paneling produced from premanufactured sets, show finished panel sizes, set numbers, sequence numbers within sets, and method of cutting panels to produce indicated sizes.
9. For paneling veneered in fabrication shop, show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
10. For countertops, show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures, locations and details of joints.

D. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.

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1. Shop-applied transparent finishes.
2. Plastic laminates, with edge treatment.
3. Edge materials.

E. Samples for Verification: For the following:

1. Lumber for transparent finish, 12 inches(300 mm) wide by 24 inches(600 mm) long, for each species and cut, finished on 1 side and 1 edge.
2. Lumber for shop-applied opaque finish, for each finish system and color, with exposed surface finished. Size: 12 inch x 24 inch(300 x 600 mm)min.
3. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
4. Wood-veneer-faced panel products with or for transparent finish, 12 by 12 inches(300 by 300 mm), for each species and cut. Include at least one face-veneer seam and finish as specified.
5. Plastic-laminate-clad panel products, 12 by 12 inches (300 by 300 mm), for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
6. Phenolic panel products with shop-applied simulated wood finish, 12 by 12 inches (300 by 300 mm)for each finish system and color, with exposed surface finished.
7. Plastic laminate clad phenolic panels, 12 by 12 inches (300 by 300 mm), for each finish, system and color, with exposed surface finish.
8. Solid-surfacing materials, 12 by 12 inches (300 by 300 mm)square for each type, color, pattern, and surface finish selected.
9. Simulated stone materials, 12 by 12 inches square for each type, color, pattern, and surface finish selected.
10. Standing and running trim including wood bases of profiles indicated with transparent and opaque finish, 12-inches (300 mm) long, for each finish system and color.
11. Specialty Panels, 12 by 12 inches(300 by 300 mm) square for each type, color, pattern, and surface finish selected.
12. Corner pieces as follows:

    a. Cabinet front frame joints between stiles and rail, as well as exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
    b. Miter joints for standing trim.
    c. Stile and rail paneling, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.

13. Exposed cabinet hardware and accessories, one unit for each type and finish.
14. Each type and finish of wood rails, molding, trim, etc… 8 inch long with finish as specified.
15. Sealant: 3 inch samples of each sealant to match each plastic laminate types specified.
16. Upholstery fabrics: Minimum 24-inch by 24-inch section of fabric from lot to be used for each color, texture, and pattern required.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For the following:

1. Composite wood and agrifiber products.
2. High-pressure decorative laminate.
3. Metal reveal and insert components.
4. Adhesives.

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B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

D. Sustainable Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Data: For recycled content of product, separately identifying the percentage of pre-consumer (post-industrial) recycled content and percentage of post-consumer recycled content.
3. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
4. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

E. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Instructions: Furnish maintenance instructions for each item specified for use during construction and for use by the Owner after acceptance of the Work. . Provide product data for care products used or recommended by installer/fabricator and names, addresses and telephone numbers of local sources for products.

1.7 QUALITY ASSURANCE

A. Standard: Comply with the following reference to Architectural Woodwork Institute (AWI):

1. "Architectural Woodwork Standards (AWS)" for grades of interior architectural woodwork, construction, finishes, and other requirements. Provide AWI Quality Certification Program indicating that woodwork, including installation, complies with requirements of grades specified.

B. Single-Source Manufacturing and Installation Responsibility: Engage a qualified Manufacturer to assume undivided responsibility for woodwork specified in this section, including fabrication, finishing, and installation.

C. Mockups: Build mockups for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of the following items in the location and of the size indicated or, if not indicated, as directed by Architect.

a. Provide dry layup of veneered panels for Architect's review prior to applying and finishing panels.
b. Each type of panel, full height with metal reveals, finished as specified.

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c. Other items of woodwork.

2. Notify Architect seven days in advance of dates and times when mockups will be fabricated and installed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting interior architectural woodwork fabrication.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed.
7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install woodwork unless HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period (60 and 90 degrees F and relative humidity between 25 and 55 percent) complying with the referenced AWS so that woodwork will not be damaged by excessive changes. Obtain and comply with Woodwork Manufacturer’s and Installer’s coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.
2. Coordinate with Division 01 Section "Temporary Facilities and Controls" for provision of air filters and dustproof partitions, to mitigate the spread of construction debris and dust from construction areas to other areas that are occupied.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Certified Wood: Woodwork for transparent finish shall be produced from wood certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

B. Wood Materials, General: Provide materials that comply with requirements of the AWS for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:

1. Surfaces and Patterns: Provide lumber surfaced 4 sides (S4S) and worked to profiles indicated.
2. Moisture Content: Kiln dry lumber to the moisture content recommended by the AWS. Not to exceed 8 - 10% moisture content upon manufacturing

C. Lumber: AWS Section 3; with the following requirements:

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1. Hardwood for Transparent Finish: Premium Grade; from same flitch as specified for wood veneer, or if not specified, Select Maple Provide uniform color, and free from catseyes, birdseyes, burls, splits, shakes, sap wood, wind checks, resin deposits, mineral discolorations; hand selected to be uniform in color and grain characteristics.
2. Hardwood for Opaque Finish: Custom Grade. Any hardwood, which, when finished, will not show any grain, imperfection or other surface defects when used with the painted finish specified.
3. Hardwood for Concealed Framing, Furring, Blocking, Shims and Hanging Strips: AWS Economy Grade, any species, fire retardant treated, kiln dried to less than 15 percent moisture content.

D. Sheet Products: AWS, Section 4, and the following:

1. Hardboard: ANSI/AHA A135.4.
2. Panel Cores:

    a. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
    b. Medium Density Fiberboard (MDF): ANSI A208.2; Exterior Glue, made without urea formaldehyde.

        1) Interior High Moisture Areas: Sierra Pine Composite Solutions, "Medex." SCS certified, no added formaldehyde, moisture resistant MDF panel engineered for interior high moisture areas.
        2) Interior Dry Areas: Sierra Pine Composite Solutions, "Medite II." SCS certified, no added formaldehyde MDF panel engineered for interior non-structural applications.
        3) Fire Retardant Treated Medium Density Fiberboard (MDF): "Medite FR" (Medite Corporation) ANSI A208.2, medium density, using fire retardant chemicals bonded to softwood particles at time of panel manufacture to achieve products identical to those tested for compliance with UL Class 1 surface spread of flame per UL 753 Flame rating Test. Products shall have appropriate markings of applicable testing and inspecting organization.

    c. Particleboard: ANSI A208.1, Grade M-2; made with binder containing no urea formaldehyde.
    d. Plywood: Veneer core plywood or particle core plywood, made with adhesive containing no urea formaldehyde; fire retardant treated where required or indicated.

        1) Softwood Plywood: DOC PS 1, medium-density overlay
        2) Hardwood Plywood: HPVA HP-1.

3. Edges: Band with min. 1/8 inch deep hardwood edge band of same wood as face and finished to match finish of panel faces.

    a. At laminate clad panels provide edge banding specified in article "Plastic Laminates" below.

4. Panel Balance Sheet: Provide balancing sheet on concealed side of panels complying with AWS Section 4.4.15; same thickness and species as face veneer for fully balanced construction.

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5. Face Veneers for Transparent Finish: Premium Grade, hardwood veneers complying with AWS Section 4; Select AA Grade, free from sapwood, knots, and other defects. Where solid wood is required, provide wood of same species, matching adjoining veneers unless otherwise indicated or specified and free from cat's eyes, bird's eyes, burls, curls or cross grains. Provide the following wood veneer where indicated; Flitch to be determined; with wood veneers hand selected by Architect for application on targeted wood cabinet elevations, and matching samples in Architect's office.

E. Upholstery Materials:

1. Fabrics: Provide products indicated on Drawings and Finish Schedules.

F. Low-Emitting Materials:

1. Adhesives and Sealants wet-applied on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. All adhesives and sealants wet-applied onsite must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4/v4.1 BD+C: New Construction".

2.2 FIRE RETARDANT TREATMENT

A. Fire Retardant Treatment: Where required by code, use materials impregnated with fire retardant chemical formulations indicated by a pressure process or other means acceptable to authorities having jurisdiction to produce products with fire test response characteristics specified.

1. Fire Retardant Chemicals: Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
2. Fire Retardant Treated Lumber: Comply with the following:

    a. Low-Hygroscopic Formulation: Interior Type A per AWPA C20.
    b. Mill lumber after treatment, within limits set for wood removal that does not affect listed fire test response characteristics, using a woodworking plant certified by testing and inspecting agency.
    c. Kiln-dry material before and after treatment to levels required for untreated material.
    d. Discard treated material that does not comply with requirements of referenced woodworking standard. Do not use twisted, warped, bowed, discolored, or otherwise damaged or defective material.
    e. Low-Hygroscopic Formulation (Type A):

        1) D-Blaze; Chemical Specialties, Inc.
        2) Dricon; Hickson Corp.
        3) Pyro-guard; Hoover Treated Wood Products, Inc.

3. 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 products identical to those tested for flame spread of 25 or less and for smoke developed of 25 or less per ASTM E84 by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting agency.

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a. For panels 3/4 inch thick and less and 45 lb/cu. ft density, 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 lbf and 225 lbf respectively.
b. For panels 13/16 to 1-1/4 inches thick and 44 lb/cu. ft density, 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 lbf and 175 lbf respectively.

B. 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 products identical to those tested for flame spread of 25 or less and for smoke developed of 200 or less per ASTM E84 by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting agency.

2.3 INTERIOR STANDING AND RUNNING TRIM

A. Grade: AWS Section 6, Premium grade for transparent finish and custom grade for painted finish.

B. Wood Species and Cut: For transparent finish, match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building, unless otherwise indicated.

1. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.

C. Wood For Painted Finish: Any closed-grain hardwood.

D. For trim items wider than available lumber, use veneered construction. Do not glue for width.

E. For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.

F. 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.

G. Assemble casings in plant except where limitations of access to place of installation require field assembly.

H. 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.

I. Provide the following standing and running trim where indicated on drawings.

1. Wood Trim: Provide solid wood trim of profiles and dimensions shown, primed for field painting.
2. Wood Bases, General: Provide bases in longest sections, with joints on the column lines, building module or wall assembly module. Provide 3 foot 7 inch formed one piece corner sections for inside and outside corners. Comply with final approved shop drawings for seam locations and details between adjacent base sections. Seams between bases shall

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occur strictly at seams in panels above. Install bases so that seams between align with seams in panels above.

3. Solid Wood Base: Provide solid wood base of profiles and dimensions shown fabricated for both flush and applied installation from same flitch as wood veneer used in wood paneling finished to match and as follows:

   a. **WDBxx**: As indicated on Drawings.

4. Painted Wood Base: Provide solid wood base of profiles and dimensions shown; fabricated for both flush and applied installations; primed for field painting

   a. **WDBxx**: As indicated on Drawings.

5. Solid-Surfacing Material Base: Provide solid surface base of profiles and dimensions shown; fabricated for both flush and applied installations.

   a. **WDBxx**: As indicated on Drawings.

2.4 PLASTIC LAMINATE

A. Quality: High-Pressure Decorative laminate (HPDL) complying with AWS Section 4, and NEMA Publication LD3.

1. Face Sheets: HGS, 0.048 inch thick for horizontal, and VGS, 0.028 inch thick for vertical application.
2. Backing Sheets: HGS, 0.048 inch for horizontal and VGS, 0.028 inch thick for vertical application.
3. Integrally Colored Solid Plastic Laminate: NEMA Publication LD3, Type HCS 62, 0.62 in. nominal thickness.
4. Cabinet Liner Sheets: CLS, 0.020 inch thick.
5. Exposed and Semi-Exposed Edges: Edge plastic laminate panels with ABS (Acrylonitrile Butadiene Styrene) “Doelken” edge banding, 3mm thick x width indicated, fabricated by Doelken Woodtape www.doellken-woodtape.com; complying with LMA EDG-1 on components with exposed or semi-exposed edges in colors to match plastic laminate faces.

B. Manufacturers: Subject to compliance with requirements, provide high pressure decorative laminates by one of the following:

1. Abet Laminati, Inc.
2. Wilsonart
3. Formica Corporation
4. Lamin-Art, Inc.
5. Nevamar Company, LLC; Decorative Products Div.
6. Pionite; Inc.

C. Types: Subject to compliance with requirements of this section, provide plastic laminates indicated as (**PLxx**) on the Finish Schedule.

2.5 SOLID SURFACING AND SIMULATED STONE

A. Solid Surfacing: Provide homogeneous solid sheets of filled plastic resin complying with ISSFA-2 ANSI Z124.3 or ANSI Z124.6.

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1. Thickness: 3/4 inch, unless otherwise indicated.
2. Provide types indicated as (**SSMxx**) on the Finish Schedule on Drawings.

B. Simulated Stone: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with the "Physical Characteristics of Materials" Article of ANSI SS1.

1. Thickness: 3/4 inch, unless otherwise indicated.
2. Provide types indicated as (**SSMxx**) on the Finish Schedule on Drawings.

2.6 BANQUETTE MATERIALS

A. Lumber: Select hardwood lumber, kiln dried to 8 percent maximum moisture content.

1. Provide dressed lumber, surfaced four sides (S4S), unless otherwise indicated.

B. Plywood: DOC PS 1, Exposure 1, C-D Plugged, not less than 1/2-inch nominal thickness.

C. Oriented Strand Board: DOC PS 2, not less than 1/2-inch nominal thickness.

D. Wood Particleboard: CS 236, Type 2, highly moisture resistant, 45-pcf density 3/4 inch thick unless otherwise indicated.

E. Wood Veneer: As indicated on Drawings.

F. Plastic Laminate: As indicated on Drawings.

G. Cushion, Padding and Backing Materials: Acceptable types include:

1. Polyurethane foam.
2. Polyester Dacron.

H. Springs: Marshall type coil springs, 12 gage minimum, oil tempered steel; individually encased and tied together with hog ring fasteners; height and coils per unit recommended by manufacturer for project application.

I. Fabrics: Colors, patterns, and manufacturers are specified on Drawings.

1. Hold fabric defects, as listed in ASTM D3990 to the minimum. No defects will be permitted on exposed faces of panels.
2. Provide uniformity of color, within the limits of the natural quality of the fiber and design of the weave, from selvage to selvage and end to end. Maintain such uniformity within each dye lot. Keep variation from one dye lot to another minimum
3. Fabrics shall be inherently flame resistant, or shall be treated to render them flame resistant, as defined in NFPA 701, Small Scale Test. Fabrics that are treated shall retain their flame resistant properties after having been subjected to the exposure cycles for accelerated cleaning or accelerated laundering specified in NFPA 701.
4. Provide fabric types, colors, patterns, and manufacturers specified on Drawings.

J. Cushioning: Flame Resistant Cushioning: Provide flame resistant cushioning complying with the following minimum requirements:

1. Compression Set: 10% maximum when tested in accordance with ASTM D3574.
2. Elongation: 150% when tested in accordance with ASTM D3574.

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3. Tensile Strength: 8 lbs/sq. in. minimum when tested in accordance with ASTM D3574.
4. Tear Strength: 2 lbs/sq. in. minimum when tested in accordance with ASTM D3574.
5. Smoke Generation: A specific optical density utilizing a 1 in. test sample in either the flaming or non-flaming mode not exceeding 175 within the first 4 minutes of the test when tested in accordance with ASTM E662.
6. Surface Flammability: Not exceeding 5 when tested in accordance with ASTM E162.
7. Manufacturer: Provide "CR Safguard" (Chestnut Ridge Foam, Inc.) or approved equal. Products of other manufacturers will be considered only if evidence is furnished showing compliance with the minimum requirements specified herein.

K. Cushion Overlay: Standard with the manufacturer to totally cover cushioning to allow retention of form.

L. Fasteners: Type, material, size, and finish recommended by manufacturer for each substrate, application, attachment, joinery, corrosion resistance and project condition.

M. Adhesives: Do not use adhesives that contain urea formaldehyde.

1. 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):

   a. Wood Glues: 30 g/L.
   b. Contact Adhesive: 250 g/L.

2.7 DECORATIVE GRILLES

A. Fabricate decorative grilles from perforated aluminum sheet or plate of thickness, size, and pattern indicated.

1. Drawings indicate perforated metal patterns required and are based on products of one manufacturer. Perforated metal patterns produced by other manufacturers may be considered, provided deviations are minor and do not change design concept as judged solely by Architect.

2.8 METALS AND PRIMERS

A. Stainless Steel: AISI Type 304.

1. Plate and Sheet: ASTM A666, Stretcher leveled sheets.
2. Bar Stock: ASTM A276.
3. Tubing: ASTM A269.
4. Finish: Grind and polish surfaces to produce uniform, multi-directional textured, polished finish indicated, free of cross scratches.

   a. No. 4 Satin finish.
   b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

B. Aluminum

1. Extrusions: ASTM B221, Alloy 6063-T6.
2. Plate and Sheet: ASTM B209, Alloy 5005-H32.

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3. Finish:

    a. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class II, clear film thicker than 0.7 mils (0.010 mm).
    b. Anodized finishes shall be fully sealed by the manufacturer or processor according to procedures recommended by the licensor of the process.

C. Steel:

1. Structural Steel Shapes and Plates: ASTM A36.
2. Cold-Rolled Carbon Steel Sheets: For concealed surfaces, commercial quality, ASTM A1008; or structural quality, complying with ASTM A1008, Grade A, unless another grade is required by design loads. For exposed parts, open hearth, full pickled, annealed, stretcher-leveled furniture steel, free of scale, waves and defects.
3. Rolled Steel Formed Channels: AISI MT-1010, cold-rolled steel, best commercial grade.
4. Steel Tubing: ASTM A500 cold-rolled steel seamless welded, best commercial grade, not less than 0.065 inches thick.
5. Interior Ferrous Metal Primer: Compatible with the finish coats of paint; shop apply primer to the respective dry film mil thickness specified or as recommended by the manufacturer. Provide one of the following:

    a. "Series 10-99" (Tnemec Co. Inc.); 2.0 - 3.5 mils dft.
    b. "Carbocoat 115 SG" (Carboline Co.); 2.0 mils dft.
    c. "Amercoat 5105" (Ameron Protective Coatings); 2.0 - 3.0 mils dft.

6. Finish: As indicated on Drawings.

D. Galvanizing Repair Paint: High zinc-dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

E. Other Metals and Primers: As specified in Section "Metalwork".

2.9 ACCESSORIES

A. Fasteners: Provide the following fasteners complying with the requirements of Industrial Fasteners Institute standards. Provide type, grade, style, size material and finish as required for the condition of use. In addition, comply with the following:

1. Wood Screws: ASME B18.6.1 for applicable requirements.
2. Nails: Federal Standard FF-N-105.
3. Anchors: Provide toothed steel or lead expansion bolt devices for drilled in place anchors. Where used to anchor metal items, anchors and inserts shall be non-corrosive and compatible with contiguous metals.

B. Z-Clips: Aluminum interlocking offset panel fasteners; by either Monarch Metal Fabrication, Eagle Mouldings, or Rockler; type, size and quantity for the condition of use.

C. Adhesives:

1. For Laminating Plastic Laminate Surfaces: Melamine, phenol-resin, or resorcinol-resin complying with FS MMM-A-181; type, grade and class best suited for the purpose.
2. General Purpose Adhesive: Moisture resistant complying with FS MMM-A125, Type II, or MMM-A-188, Type I, II or III; type best suited for the purpose.

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3. VOC Limits for Installation Adhesives: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

    a. Wood Glues: 30 g/L.
    b. Multipurpose Construction Adhesives: 70 g/L.
    c. Contact Adhesive: 80 g/L.
    d. Special Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.

4. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Plastic Seam Filler: Plastic seam and repair filler in color to match plastic laminate.

1. Product: Seamfil, Kampel Enterprises, Inc.

E. Colored Sealant: Acrylic latex sealant in color to match plastic laminate.

1. Product: Colorflex, Kampel Enterprises, Inc.

F. Sanitary Sealant: As specified in Division 07, "Joint Sealants".

2.10 CABINET HARDWARE AND ACCESSORY MATERIALS

A. Provide the following items, or their approved equal, as required, unless otherwise indicated on drawings:

1. Concealed European Hinges for Cabinet Doors: Provide the following, in quantities as required by manufacturer for height, width, and weight of cabinet door:

    a. "Grass Nexis Self-Close 170-degree hinge - Half Overlay; 148.765.53.0815" (Grass); self-closing, soft close compatible.

2. Invisible Hinges for Full Height Doors:

    a. Model #100 S0SS Invisible Hinge.

3. Latches: Touch activated type, unless otherwise indicated.
4. Catches: Magnetic type; top and bottom catches, BHMA A156.9, B03141, unless otherwise indicated. Provide catches as manufactured by Epco or Ives unless otherwise indicated or specified.
5. Overhead Stop Arm: Concealed overhead stop arm installed at top of door to frame to prevent closet doors from opening beyond 90 degrees when open.
6. Finger Pulls: Where indicated, provide routed recess with finish to match finish of door/drawer.
7. Cabinet and Drawer Pulls: As indicated on Drawings.
8. Drawer Pulls: As indicated on Drawings.
9. Drawer Slides: Side-mounted, full-extension, soft closing type, zinc-plated steel drawer slides with steel ball bearings, complying with BHMA A156.9, Grade 1 and rated for the following loads:

    a. Box Drawer Slides: Provide "3832EC" (Accuride) or "Dynamic NT" (Grass) complying with Grade 1HD-100 for drawers up to 100 lbs.; full extension, progressive movement, rail mounted.

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b. File Drawer Slides: Provide soft closing/self-closing type from Accuride or Grass complying with Grade 1 HD-200 for drawers up to 200 lbs and drawer width 30 in. and up.
c. Pencil Drawer Slides: Provide soft closing/self-closing type from Accuride or Grass, complying with Grade 1, for drawers up to 65 lbs., full extension, rail mount, for shallow drawers up to 3 in. deep.

10. Locks: Provide locks appropriate to purpose intended as manufactured by Dom Locks, Knape & Vogt, or Timberline Locks; unless otherwise indicated or specified.

    a. Door Locks: BHMA E07121.
    b. Drawer Locks: BHMA E07041.

11. Flush bolts: "No. 40, Concealed Screw Surface Bolt" (H. B. Ives), or approved equal, 6 in. long, furnished with top and bottom mortised strike plates.
12. Sliding Door Track: BHMA A156.14; Provide as a complete set, including track, trolleys, brackets, floor guides, concealed floor sheaves and wheels and other items required for a complete installation.

    a. (Hafele, HAWA AG) Junior 250B sliding door track, trolleys, carriers, clear anodized track.

13. Felt or Rubber Silencers: Provide felt or rubber silencers on jamb and/or head and sill strike areas of all cabinet doors; 4 for paired doors, 3 for single leaf doors.
14. Waste and Recycling Bins and Drawer Slides: "503-13-533/503-13-733" (Hafele) soft-close, bottom mounted waste and recycling bins, with heavy duty full extension ball bearing slides, door mounting brackets, face frame adapter, and mounting hardware; dual capacity removable waste baskets.
15. Grommets:

    a. "PS Series" (Doug Mockett); size and location as indicated; plated steel grommet with satin chrome finish unless otherwise indicated or specified; for flush mounting with adjacent counter tops.
    b. Brush Grommet: Doug Mockett & Company BREXT2 brush grommet and extrusion. Size: 1-3/16 inch deep, 2 foot lengths. Brush and extrusion color: As selected by Architect.
    c. Paper Slot Grommet: Doug Mockett & Company Paper Slot Grommet CP3, 6 inch grommet. Color: As selected by Architect.
    d. Round Grommet: Doug Mockett "ABG3" 3-1/2 in. diameter. Finish to be selected by the Architect from Manufacture's full range of options. Provide with opposing arc cap with oval cord slot lined with radiused brush finish. Fabricated from extruded and machined aluminum.

16. Wire Manager: Doug Mockett & Company Ugliest Wire Manager WM9. Size: lengths as required by millwork conditions. Color: Black. Mechanically fasten to millwork; double-stick tape installation is not acceptable.
17. Furniture and Equipment Castors: Hafele 661.23.304 castor for furniture with screw-on mounting plate. Housing: Steel, galvanized; wheel: plastic, black.
18. Metal Supports: One of the following as required for loading condition indicated, with manufacturer's standard caps at top and bottom where indicated, and screw mounted shelf rests as required for condition of use:

    a. Exposed Countertop Supports: Series EH type anodized extruded aluminum brackets from Rakks with associated standards; as follows:

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1) EH-1209-FM for up to 13 inch counters
2) EH-1212-FM for up to 18 inch counters
3) EH-1818-FM for up to 25 inch counters
4) EH-1824-FM for up to 30 inch counters Levelers: Heavy duty steel channel type

b. Exposed Shelving Supports:

1) Medium Duty: "No. 102 standards and No. 1706 brackets" (Capitol Hardware) or "No. 80 standards and No. 180 brackets" (Knape & Vogt Mfg. Co.).
2) Heavy Duty: "No. 2000 standards and No. 2001 brackets" (Capitol Hardware) or "No. 87 standards and No. 187 brackets" (Knape & Vogt Mfg. Co.).
3) Flush Mounted Medium Duty Standards: "No. 74" (Capitol Hardware) or No. 71" (Knape & Vogt Mfg. Co.).
4) Cabinet Shelf Supports: "No. 256" (Knape & Vogt Mfg. Co.) for use with "No. 255 Flush Mount Standards" (Knape & Vogt Mfg. Co.).

c. Cabinet Shelf Supports (pin-type for cabinets with holes in sides): "No. 282.11.761 "Hafele) or approved equal, for use with predrilled holes in sides of cabinet for medium duty application.
d. Countertop Supports: As indicated and as specified in Division 05 Section "Metal Fabrications".

19. Velcro Fastenings: "Industrial Strength Low Profile Fasteners" (Velcro.com).
20. Architectural Woodwork Hardware Finishes: For exposed architectural woodwork hardware, provide finish that complies with ANSI/BHMA A156.18 for BHMA code number indicated, as follows unless otherwise specified:

a. Exposed Areas:

1) Satin Stainless Steel: BHMA 630; except if base metal is not available in stainless steel, provide BHMA 626 Satin Chromium Plated brass, bronze or BHMA 652 Satin Chromium Plated Steel.

b. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of ANSI/BHMA A156.9.

2.11 MISCELLANEOUS MATERIALS

A. Applications: Planter liners.

1. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, 5/8 inch thick, with manufacturer's standard edges, and mold resistance of 10 when tested in accordance with ASTM D3273.
2. Subject to compliance with requirements, provide one of the following:

a. Custom Building Products; Wonderboard.
b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
c. USG Corporation; DUROCK Cement Board.

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2.12 FABRICATION, GENERAL

A. Provide interior woodwork complying with AWS "Woodwork Standards" for Premium Grade for wood veneered architectural woodwork. Provide Custom Grade for painted finish, unless otherwise specified.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

C. Fabricate the work to dimensions, profiles and details indicated verified from field dimensions. 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. Trial fit assemblies at the 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 approved shop drawings before disassembling for shipment.

D. Ease edges to radius indicated for the following:

1. Corners of cabinets and edges of solid wood (lumber) members 3/4 inch thick or less: 1/16 inch.
2. Edges of rails and similar members more than 3/4 inch thick: 1/16 inch.

E. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings.

1. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting to meet built-in conditions.
2. Sand edges of cutouts to remove splinters and burrs. Sand fire retardant treated wood lightly to remove raised grain on exposed surfaces before fabrication.
3. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating

F. Provide lumber framing for architectural woodwork, with bracing and fastening devices required for rigid installation, and as required to sustain imposed loads.

G. Accurately fit all joints, corners and miters. Conceal fasteners, and tighten threaded connections so that threads are concealed. Provide stock items and components whenever possible.

H. Veneering, General: The Architect will assign specific flitches for specific elevations. Wood veneer panels shall be laid up at the woodworker's facility. Bond veneers to cores by the hot press method. Center book match and end match full width panels. Provide two piece match panels for plain sliced veneer species. Blueprint, balance and sequence match and full flitch match paneling and elevations of architectural woodwork. Remove all sapwood. Veneer joints on finished faces of work shall be glue species, not stitched. Veneer knife marks are unacceptable. Tapeless or hand taped butt joints (no stitched faces). When splicing, match cathedral pattern of wood so that splice shall appear seamless in the finish work.

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1. Semi-exposed (behind cabinet doors) cabinet interiors shall be slip matched, balanced and sequenced for consistent appearance.
2. Non-exposed cabinet interiors (behind drawers) do not require special matching.

I. Provide finishes as indicated or specified. Factory finish all items where possible. Shop finish and deliver to site complete, and ready for installation, Defer final touch-up, cleaning and polishing after delivery and installation.

2.13 ARCHITECTURAL CABINETWORK

A. Quality: Provide cabinetwork in accordance with AWS Section 10, "Casework" Premium Grade, for wood veneered cabinetwork and plastic laminate clad cabinetwork, custom grade for painted wood cabinetwork.

1. Type of Construction: Type A, Frameless.
2. Cabinet and Door and Drawer Front Interface Style: Flush overlay.
3. Cores: Plywood countertops and shelving, plywood for cabinet bodies, and MDF for doors and end panels. Provide moisture resistant products in wet areas, fire retardant treated products where cabinets are directly mounted to fire rated partitions.

B. Cutouts and Coordination: Include preparations for mechanical, electrical, telephone, computer equipment and plumbing work required. Prepare cabinets, which contain computer equipment, to receive cooling fans, air slots for air circulation within the equipment area of sizes as indicated or required, wireways for electrical, data and communication wires, and grommets and other openings to allow for items indicated. Allow for cable conduits entering casework from different directions. In areas where indicated or required, provide removable panels and access doors.

C. Cabinetry Doors and Panels: Fabricate cabinetry doors and panels of solid panel cores as specified. Hollow core doors will not be permitted. Provide cabinet hardware as indicated or specified.

1. Provide concealed self-closing hinges and felt bumpers, with pulls, unless otherwise indicated. Utilize invisible hinges on full height doors.
2. Provide locks on doors indicated to be locked. At paired doors provide surface bolts, mounted on the back side of door, for closure of inactive leaf.
3. Provide combination roller latch/angle head stops for double doors.

D. Countertops in Cabinetry: For casework to be installed in cabinetry above convectors and in pantries or other wet areas, and any cabinet to receive a sink, use marine grade plywood or veneer core plywood substrates.

E. Drawers: Construct drawers from solid hardwood lumber, with dovetailed 4 sided box with separate adjustable, exposed front. Provide 3/8 in. thick hardwood plywood panels of same species for drawer bottoms. Set bottoms into sides and front.

1. Provide drawers with slides as specified.
2. Provide dust panels of 1/4 in. plywood or tempered hardboard above compartments in body webs and drawers except where located directly under tops.
3. Drawers shall not rest on web body frames; provide drawer slides of hardware specified or indicated.

F. Shelving: Provide fixed and adjustable wood shelving fabricated from min. 3/4 in. thick wood panels matching construction of wood panels specified.

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1. Engineer shelf material to achieve 1/8 in. or less deflection
2. Finish exposed shelving with of type specified to match adjacent finishes. Finish semi-exposed shelving and as indicated.
3. For adjustable shelving, provide for installation of shelf support hardware indicated.

G. End panels: Provide end panels where indicated, fabricated same as face panels.

H. Where indicated, provide recess in upper cabinets to accommodate under cabinet mounted lighting indicated. Coordinate with electrical work as required to mount lighting and wiring of fixtures.

I. Wood Cabinets with Veneer Finishes:

1. Finish exposed wood veneered surfaces with wood veneer type indicated complying with the following matching requirements and transparent finish requirements specified.

    a. Grain Direction: Vertically for drawer fronts, doors and fixed panels
    b. Veneer Matching: Book match
    c. Veneer Matching within Panel Face: Center balance match.

2. Semi-exposed surfaces of wood cabinetwork shall be provided with same finish and species as the face veneer, except they may be of quality, size and leaf width not acceptable for face use.
3. Finish cabinet interiors of wood veneered cabinetry, and semi-exposed surfaces with same wood veneer, except semi-exposed grade, and with clear lacquer finish.
4. Stain drawer sides, backs, and bottoms to match species indicated for exposed surfaces, shop finished.

J. AV Cabinetry: Provide woodwork cabinetry of profiles and dimensions indicated finished inside and out with wood veneer type indicated applied to comply with veneering requirements in paragraph "Veneering, General"

1. Coordinate with the Owner's AV consultant to provide enclosures and support for audio-visual equipment.
2. Provide full height doors complying with AWS for premium flush wood doors with veneer matching as specified.
3. Provide sliding wood doors using sliding door hardware specified.
4. Install felt bumpers to allow for smooth opening and closing of doors.

K. Plastic Laminate Cabinets:

1. AWS Type of Cabinet Construction: Flush Overlay.
2. Reveal Dimension: As indicated.
3. Laminate Cladding for Exposed Surfaces: High pressure decorative laminate as follows:

    a. Horizontal Surfaces Other Than Tops: Grade HGS.
    b. Post formed Surfaces: Grade HGP.
    c. Vertical Surfaces: Grade VGS.
    d. Edges: Edge Tape matching exposed laminate in color, pattern, and finish.

4. Materials for Semi-exposed Surfaces Other Than Drawer Bodies: High pressure decorative laminate, Grade VGS.
5. Colors, Patterns, and Finishes: As specified.
6. Install felt bumpers to allow for smooth opening and closing of doors.

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2.14 BANQUETTES

A. General: Fabricate banquettes to comply with sizes, shapes, and dimensional requirements indicated for components. Apply upholstery fabrics and wood veneer finishes to comply with details indicated.

B. Complete fabrication, including assembly, and finishing 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.

C. Provide mortises and tenons of size required to provide maximum strength in the assembled joint. The tenons shall fit the mortises completely and tightly; using blind tenons wherever through tenons would show in the finished work. Glue stains will not be permitted.

D. Fabricate substructure of wood materials as recommended by fabricator and in accordance with Drawings. Provide required reinforcing which results in a rigid frame.

E. Upholstery cushion fabrication: Shop fabricate cushions to dimensions indicated with fabric type indicated, and cushion materials specified using application methods required to achieve a smooth undistorted finish to the satisfaction of the Architect.

1. Lay upholstery material smooth and even.
2. Cut evenly along intersecting surfaces.
3. Upholster material smooth with sufficient tension so that the finished installation is free of tacks, scraps, ripples, scallops or puckers.
4. Provide self-welt edges of same material as face fabric.
5. Sew seams with blind double stitching.
6. Fabricate cushions with Velcro attachments on the underside to secure to benches.
7. Fabricate cushions, so that fabrics may be removed, laundered and reapplied.
8. Provide high density cushion materials.

2.15 COUNTERTOPS

A. Fabricate wood countertops of sizes and profiles indicated, in accordance with AWS Section 11 "Countertops", Premium Grade for plastic laminate clad countertops.

B. Provide countertops in longest length possible for each location indicated. Where seams are required, provide in inconspicuous locations and obtain Architect's approval of locations in the shop drawing process. Comply with countertop material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing. Sealant shall be in colors matching components and selected by Architect.

C. Provide balancing face, on concealed side of countertops, of same thickness and material as specified for face, except concealed grade, to equalize pull and prevent warpage, twist or bow.

D. Provide wood blocking and framing, anchors, clips, splines, supporting and attaching devices. Provide cut-outs to receive attachments, supporting substructure, mechanical and electrical work from templates and drawings furnished by other trades. Provide grommets in locations where wiring enters or exits from countertop.

E. Provide supports running the full depth of countertops, to support countertops at intervals no greater than 5 ft. Provide fascias, skirts or backsplashes of profiles and sizes indicated, and fabricated the same as countertops.

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1. Provide additional concealed reinforcing of countertops to receive food service equipment to maintain clearances and tolerances without any perceivable deflection or bowing of countertops.

F. Coordinate with Division 05, Section "Metalwork" for provision of steel tube support brackets, and vertical steel tubes to support countertops at lavatories and where not supported by cabinets below

1. Provide installation capable of withstanding a uniform load of 100 lbf/linear feet and a concentrated load at any point of 300 lbs.

G. Accurately cut, drill, fit and finish countertops in the shop. Locate and accurately shop-cut countertops for attachment of work by other trades from templates furnished by those trades.

1. Cutouts and Holes: Make cutouts for undercounter fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 in. into fixture opening.
2. Counter-Mounted Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.16 PANELING

A. General: Panels shall be in accordance with AWS, Section 8, Premium Grade construction.

1. Panel Joints: Flush type, unless otherwise indicated.
2. Provide cut-outs to receive attachments, mechanical and electrical work as required. 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. Smooth edges of cutouts.
3. Panel joints shall be flush type unless otherwise indicated or specified.
4. Provide balancing veneer/sheet on concealed side of panels, using same species/type as the face veneer/sheet, to equalize pull.
5. Provide wood blocking and framing, anchors, clips, splines, supporting and attaching devices.
6. Provide panel clips in quantity and spacing to sustain loading and prevent warping and bowing of panels.
7. Where trims are indicated, route surfaces of panels and laminate trim material to plywood backup.

B. Wood Veneer Paneling:

1. Comply with AWS, Premium Grade.
2. Fabricate panels from medium density fiberboard cores.
3. Provide veneers and finishes as specified and as indicated, including matching requirements specified in paragraph "Veneering".

C. Tackable Panels: Provide tackable wall panels of profiles and dimensions indicated, fabricated from material listed on Material and Finish schedule. Fabricate panels in segments indicated

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held together with adhesive and backing and finished at perimeter with the following edge angle trim:

1. Stainless steel angle edge trim to finish exposed edges of wall coverings where indicated. Provide No. 4 finished Type 304 stainless steel trims min. 1/8 inch thick, with ease edges
2. Provide tackable panel types as indicated on the Material and Finish Schedule.

D. Solid Surfacing Paneling with Custom Routed Design:

1. Basis of Design Manufacturer: M|R Walls by Mario Romano.
2. Face Panels: Solid surfacing, 1/2 inch (12.7 mm) thick.

    a. Shapes: Panel sizes and shapes determined by manufacturer based on specifics of design.
    b. Routing Design: As indicated on Drawings.
    c. Depth of Routing: As indicated on Drawings.
    d. Color: As indicated on Drawings.

3. Backer Panels: 3/4-inch thick fire-retardant-treated plywood, type selected by paneling fabricator.
4. Adhesives: Use type recommended by solid surfacing manufacturer and panel fabricator for adhering face and backer panels.
5. Mounting: Screws through CNC machined holes in panel.

    a. Provide plugs with matching solid surfacing material to cover holes.

6. Bronze Logo: Incorporate logo element into overall design.

2.17 MISCELLANEOUS ARCHITECTURAL WOODWORK ITEMS

A. Fabricate and install miscellaneous items of Architectural Woodwork not specified herein, which are indicated on Drawings, or required to complete the Contract, in accordance with requirements of referenced standards.

B. Miscellaneous architectural woodwork items include, but are not limited to:

1. Planters: Fabricate in sections for field-assembly.

2.18 FACTORY FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

A. Provide finishing matching the grade of fabrication and complying with AWS Section 5 for each item of woodwork involved. To the greatest extent possible, finish architectural woodwork at factory. Defer only final touch-up, cleaning, and polishing until after installation.

1. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

    a. Back priming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to surfaces installed in contact with concrete or masonry and to end grain surfaces.

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B. Transparent Finish for Exposed Wood Veneer:

1. Grade: Premium.
2. AWS Finish System: Factory Transparent Finish System No. 3, Lacquer, Postcatalyzed Finish.
3. Staining: As selected by Architect.
4. Wash Coat for Stained Finish: Apply a wash coat sealer to woodwork made from closed grain wood before staining and finishing.
5. Open Grain Woods: Prior to finish, apply paste wood filler to open grain woods and wipe off excess. Tint filler to match wood.
6. Sheen: As indicated on the Material and Finish Schedule.

C. Opaque Finish:

1. Grade: Premium.
2. AWS Finish System: Factory Opaque Finish System No. 2, Precatalyzed lacquer Finish.
3. Open Grain Woods: Prior to finish, apply paste wood filler to open grain woods and wipe off excess. Tint filler to match wood.
4. Color: As selected by Architect from manufacturer's full range.
5. Sheen: As indicated on the Material and Finish Schedule.

D. Unexposed Wood Finish: Alkyd type primer-sealer.

E. Field Painted Woodwork: Prime and back prime lumber for painted finish. Comply with requirements for surface preparation and application in Division 9 Section "Interior Painting" for field painted woodwork.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

1. Before installing architectural woodwork, examine shop fabricated work for completion and complete work as required, including removal of packing and back priming.
2. Coordinate with installation of feature wall with the installation of fire retardant wood sheathing and gypsum drywall partitions to support feature wall.

3.2 INSTALLATION

A. AWS Standards for the same grade specified in Part 2 for fabrication of type of woodwork involved.

1. Install woodwork plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8 inch in 96 inches for plumb and level (including tops); and with no variations in flushness of adjoining surfaces. Shim as required with concealed shims.
2. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

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3. 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.
4. Preservative Treated Wood: Where cut or drilled in field, treat cut ends and drilled holes according to AWPA M4.
5. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed "Z" clip fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.
6. Cabinets: Install without distortion so that 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 the installation of hardware and accessory items as indicated.

    a. Install cabinets with no more than 1/8 inch in 96 inch sag, bow, or other variation from a straight line.
    b. 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 or No. 10 wafer head sheet metal screws through metal backing or metal framing behind wall finish.
    c. Seal seams between plastic laminate panels with plastic seam filler.

7. Banquettes: Install banquettes level and plumb, with fasteners and shims concealed, according to manufacturer's written instructions. Tighten threaded connections so threads are concealed.

    a. Install cushioning in accordance with shop drawings to provide a firm surface. Cover entire cushion assembly with cushion overlay prior to upholstering banquette.
    b. Lay upholstery material smooth and even.
    c. Cut evenly along intersecting surfaces.
    d. Provide buttoned upholstery where indicated.
    e. For channeled upholstery, seams shall be inconspicuously concealed between the channels.
    f. All upholstery material shall be aligned so that lines of channels are straight and continuous and with channels parallel to each other, and with vertical lines perpendicular.
    g. Upholster material smooth with sufficient tension so that the finished installation is free of tacks, scraps, ripples, scallops or puckers.
    h. All seams shall be sewn in lieu of wrapped.
    i. Apply fabrics to surfaces indicated using application methods and fastenings as recommended by the fabric manufacturer to achieve a smooth, undistorted finish to the satisfaction of the Architect.
    j. Coordinate with Electrical work for outlets and plates.

8. Countertops: Anchor securely to base units and other support systems as indicated.

    a. Install countertops with no more than 1/8 inch in 96 inch sag, bow, or other variation from a straight line.
    b. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c.
    c. Seal space between backsplash and wall, interface between backsplash and countertop, and joints between countertops and plumbing fixtures with colored

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sealants. Use mildew resistant sanitary sealants as specified in Division 07 Section "Joint Sealants" at toilet room vanities.

9. Standing and Running Trim: Install standing and running trim in accordance with AWS Install with minimum number of joints possible, using full length pieces for each run.

    a. Stagger joints in adjacent and related members. Cope at returns, miter at corners to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end to end joints. Plane backs of casings to provide uniform thickness across joints, if required.
    b. Miter cut all running joints: butt joints are prohibited. Cut running joints away from direction of major view.
    c. Install trim after gypsum board joint finishing operations are completed.
    d. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

10. Sliding Door Panels: Install sliding doors plumb, level, in alignment, and adjust as required for a smooth, quiet operation. Provide rubber bumpers to stop doors when in the fully open position and provide rubber bumpers at top leading edge of doors to soften landing of doors when closed.
11. Decorative Panels: Install decorative panels flush recessed fasteners to existing subframe. Install panels flush, in alignment across entire elevation.
12. Installation of Accessories: Install in a precise manner in accordance with manufacturer's directions. Turn screws to a flat seal; do not drive. Adjust moving parts to operate freely without excessive bind.
13. Hardware Adjustment: Adjust and lubricate operable hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.
14. Complete finishing work specified in this Section to extent not completed at shop or before installation of paneling. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.
15. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed. Comply with VOC requirements for touch up work.

3.3 INSTALLATION OF PANELING

A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels.

1. Leave 1/4-inch (6-mm) gap to be covered with trim at top, bottom, and openings.
2. Install with uniform tight joints between panels.
3. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners.
4. Space fasteners and adhesive as recommended by panel manufacturer.
5. Conceal fasteners to greatest practical extent.
6. Arrange panels with grooves and joints over supports.

    a. Fasten to supports with nails of type and at spacing recommended by panel manufacturer.
    b. Use fasteners with prefinished heads matching groove color.

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B. Hardboard Paneling: Install according to manufacturer's written instructions.

1. Leave 1/4-inch (6-mm) gap to be covered with trim at top, bottom, and openings.
2. Butt adjacent panels with moderate contact.
3. Use fasteners with prefinished heads matching paneling color.
4. Wood Stud or Furring Substrate: Install with 1-inch (25-mm) annular-ring shank hardboard nails.
5. Plaster or Gypsum-Board Substrate: Install with 1-5/8-inch (41-mm) annular-ring shank hardboard nails.
6. Nailing: Space nails 4 inches (100 mm) o.c. at panel perimeter and 8 inches (200 mm) o.c. at intermediate supports unless otherwise required by manufacturer.

C. Board Paneling: Install according to manufacturer's written instructions.

1. Arrange in random-width pattern suggested by manufacturer unless boards or planks are of uniform width.
2. Install in full lengths without end joints.
3. Stagger end joints in random pattern to uniformly distribute joints on each wall.
4. Install with uniform end joints with only end-matched (tongue-and-groove) joints within each field of paneling.
5. Install with uniform end joints. Locate end joints only over furring or blocking.
6. Select and arrange boards on each wall to minimize noticeable variations in grain character and color between adjacent boards.
7. Install with uniform tight joints between boards.
8. Fasten paneling by face nailing, setting nails, and filling over nail heads.
9. Fasten paneling with trim screws, set below face and filled.
10. Fasten paneling by blind nailing through tongues.
11. Fasten paneling with paneling system manufacturer's concealed clips.
12. Fasten paneling to gypsum wallboard with panel adhesive.

D. Solid Surfacing Paneling with Custom Routed Design:

1. Follow panel manufacturer's installation map/guide in fitting paneling sections together.
2. Seam paneling sections together using color coordinated solid surfacing joint adhesive to create inconspicuous seams.
3. Mount panels with plumb and level vertical and horizontal edges, respectively.
4. Repair minor imperfections and cracked seams and replace areas of severely damaged surfaces in accordance with manufacturer’s instructions.
5. Remove excess adhesive and sealant from visible surfaces.

END OF SECTION 064000

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SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Plastic-laminate-clad architectural cabinets.
2. Cabinet hardware and accessories.
3. Miscellaneous materials.

C. Related Requirements:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
2. Division 12 Section "Solid Surfacing Countertops."

1.2 COORDINATION

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

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 087100 "Door Hardware" to manufacturer of architectural cabinets; coordinate Shop Drawings and fabrication with hardware requirements.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Plastic-laminate-clad architectural cabinets.
2. Cabinet hardware and accessories.
3. Miscellaneous materials.

B. Product Data Submittals: For each product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

C. Sustainable Design Submittals:

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D. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
5. Apply AWI Quality Certification Program label to Shop Drawings.

E. Samples: For each exposed product and for each color and texture specified, in manufacturer's or manufacturer's standard size.

F. Samples for Initial Selection: For each type of exposed finish.

G. Samples for Verification: For the following:

1. Plastic Laminates: 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish required.

   a. Provide one sample applied to core material with specified edge material applied to one edge.

2. Thermally Fused Laminate (TFL) Panels: 8 by 10 inches (200 by 250 mm), for each color, pattern, and surface finish.

   a. Provide edge banding on one edge.

3. Corner Pieces:

   a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
   b. Miter joints for standing trim.

4. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Certificates: For each type of product.

1. Composite wood products.
2. Thermally fused laminate panels.
3. High-pressure decorative laminate.
4. Adhesives.

C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

D. Field quality-control reports.

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1.6 CLOSEOUT SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.

B. Installer Qualifications: Manufacturer of products.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups of typical architectural cabinets as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

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

1.9 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Environmental Limitations with Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70 percent during the remainder of the construction period.

C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

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

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PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Architectural Woodwork Standards Grade: Premium.

C. Type of Construction: Frameless.

D. Door and Drawer-Front Style: Flush overlay.

E. High-Pressure Decorative Laminate: ISO 4586-3, grades as indicated or if not indicated, as required by quality standard.

F. Exposed Surfaces:

1. Plastic-Laminate Grade: VGS.
2. Edges: Grade VGS.
3. Pattern Direction: Vertically for doors and fixed panels, horizontally for drawer fronts.

G. Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, ISO 4586-3.

    a. Edges of Plastic-Laminate Shelves: PVC T-mold matching laminate in color, pattern, and finish.
    b. Edges of Thermally Fused Laminate Panel Shelves: PVC or polyester edge banding.
    c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, ISO 4586-3, grade to match exposed surface.

2. Drawer Sides and Backs: Thermally fused laminate panels with PVC or polyester edge banding.
3. Drawer Bottoms: Hardwood plywood.

H. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.

I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, ISO 4583-3, grade to match exposed surface.

J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued dovetail joints.

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K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Match Architect's sample.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
2. Particleboard (Medium Density): ANSI A208.1, Grade M-2.
3. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of ISO 4586.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products in accordance with test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials 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 qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.
4. Mill lumber before treatment and implement procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying

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sticks or other causes, marring, and other defects affecting appearance of architectural cabinets.

C. Fire-Retardant Particleboard: 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 in accordance with ASTM E84.

1. For panels 3/4 inch (19 mm) thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi (11 MPa); modulus of elasticity, 300,000 psi (2070 MPa); internal bond, 80 psi (550 kPa); and screw-holding capacity on face and edge, 250 and 225 lbf (1100 and 1000 N), respectively.
2. For panels 13/16 to 1-1/4 inches (20 to 32 mm) thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi (9 MPa); modulus of elasticity, 250,000 psi (1720 MPa); linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf (1100 and 780 N), respectively.

D. Fire-Retardant Fiberboard: MDF panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less in accordance with ASTM E84.

2.4 CABINET HARDWARE AND ACCESSORIES

A. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.

B. Back-Mounted Pulls: BHMA A156.9, B02011.

C. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.

D. Catches: Magnetic catches, BHMA A156.9, B03141.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081 stainless steel.

F. Shelf Rests: BHMA A156.9, B04013; metal.

G. Drawer Slides: BHMA A156.9.

1. Grade 1HD-100: Under mounted; full-extension, self-closing type; zinc-plated steel zinc-plated-steel ball-bearing slides.

   a. Available Product: Accuride 3132SC."

2. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
3. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1HD-100.
4. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-200.
5. For computer keyboard shelves, provide Grade 1HD-100.

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6. For trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide, provide Grade 1HD-200.

H. Door Locks: BHMA A156.11, E07121.

I. Drawer Locks: BHMA A156.11, E07041.

J. Door Cam Locks: BHMA A156.11, E07261; brushed chrome.

K. Drawer Cam Locks: BHMA A156.11, E07261; brushed chrome.

L. Door and Drawer Silencers: BHMA A156.16, L03011.

M. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Dark, Oxidized, Satin Bronze, Oil Rubbed: BHMA 613 for bronze base; BHMA 640 for steel base; match Architect's sample.
2. Bright Brass, Clear Coated: BHMA 605 for brass base; BHMA 632 for steel base.
3. Bright Brass, Vacuum Coated: BHMA 723 for brass base; BHMA 729 for zinc-coated-steel base.
4. Satin Brass, Blackened, Bright Relieved, Clear Coated: BHMA 610 for brass base; BHMA 636 for steel base.
5. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
6. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.
7. Satin Stainless Steel: BHMA 630.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesive for Bonding Plastic Laminate: Type II water-resistant type as selected by fabricator to comply with requirements.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.6 FABRICATION

A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.

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2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c, using fasteners or anchors suitable for wall construction materials.

3.3 ADJUSTING AND CLEANING

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

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

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END OF SECTION 064116

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SECTION 070543 - CLADDING SUPPORT SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. CMH adjustable sub-framing support system with in-fill continuous insulation integrated within exterior wall cladding included in the “Related Requirements” paragraph below.

    a. Structural Substrate: Exterior sheathing over metal stud framing.

C. Related Requirements:

1. Division 05 Section “Cold-Formed Metal Framing” for metal stud substrate support framing.
2. Division 06 Section “Sheathing” for exterior sheathing.
3. Division 07 Section “Air Barriers” for weather barrier at exterior wall.
4. Division 07 Section “Insulation” for continuous insulation.
5. Division 07 Section “Cementitious Wall Panels” for cladding assembly type CWP-01.
6. Division 07 Section “Formed Metal Wall Panels” for cladding assembly type MTP-01.
7. Division 07 Section “Formed Metal Wall Panels” for cladding assembly type MTP-02.
8. Division 07 Section “Joint Sealants” for perimeter sealants.

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code.

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1.3 REFERENCE STANDARDS

A. ASCE American Society of Civil Engineers (www.asce.org).

1. ASCE 7 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2022.
2. ASCE – Structural Plastics Design Manual.

B. ASTM International – American Society for Testing and Materials (www.astm.org).

1. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
2. ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attachment Gypsum Panel Products; 2020.
3. ASTM C1363 – Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus; 2019.
4. ASTM D570 – Standard Test Method for Water Absorption of Plastics; 2022.
5. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.
6. ASTM D638 – Standard Test Method for Tensile Properties of Plastics; 2022.
7. ASTM D696 – Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between minus 30 degrees C and 30 degrees C with a Vitreous Silica Dilatometer; 2016.
8. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2017.
9. ASTM D792 – Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement; 2020.
10. ASTM D4385 – Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products; 2019.
11. ASTM D6641/D6641M – Standard Test Method for Compressive Properties of Polymer Matrix Composite Materials Using a Combined Loading Compression (CLC) Test Fixture, 2016e2.
12. ASTM D7332-B – Standard Test Method for Measuring the Fastener Pull-Through Resistance of a Fiber-Reinforced Polymer Matrix Composite; 2022.
13. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
14. ASTM E119 – Standard Test Method for Fire Tests of Building Construction and Materials; 2022.

C. NFPA – National Fire Protection Association (www.nfpa.org).

1. NFPA 285 – Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

1.4 DEFINITIONS

A. CMH: Composite metal hybrid.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordinate installation of continuous insulation sub-framing support system as indicated on drawings for proper drainage, flashing, trim, backup support, soffits, and other related Work.

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1. Review and finalize construction schedule.
2. Verify availability of materials, installer's personnel, equipment, and facilities needed to meet established schedule.
3. Review means and methods related to installation in accordance with manufacturer's installation instructions.
4. Examine support conditions for compliance with installation requirements, including alignment and attachment to structural support system.
5. Review flashings, wall cladding details, wall penetrations, drainage plane, openings, and condition of other construction that is related to this Work.
6. Review temporary protection requirements for during and after installation of this Work.

1.6 ACTION SUBMITTALS

A. Product Data: Submit for each product being used as indicated, including installation details, material descriptions, dimensions of individual components and profiles, and necessary accessories for a complete assembled system.

1.7 INFORMATIONAL SUBMITTALS

A. Test and Engineering Reports: Submit Test and Engineering reports on each type of composite sub-framing system based on the evaluation of comprehensive tests performed by a certified testing agency and/or Professional Engineers (PE) approved by authorities having jurisdiction.

1. Structural Composite Sub-Framing Submittal: Provide PE stamped calculations for the composite sub-framing system carrying the associated cladding system that takes into account:

    a. Anisotropic properties of the sub-framing.
    b. Point loading of the fasteners and representative dynamics of the cladding system.
    c. Uniform loading calculations not being allowed as it is not representative to actual wall systems.
    d. Calculations for eccentric cantilever conditions.
    e. Calculations providing a safety factor minimum of 4 at the high service temperature of 180 degrees Fahrenheit.
    f. Fastener Creep and Durability Test for FRP sub-girts, certified by third party/PE. Test to be completed per reference section 2.03E.
    g. Fire: ASTM E84 Class A and NFPA 285 tested for the specific wall assembly in this project.

1.8 CLOSEOUT SUBMITTALS

A. Warranty: Submit manufacturer's sample warranty and ensure forms have been completed in Owner's name, registered with manufacturer for the Manufacturer's Warranty for the Sub-Framing System, and FRP Manufacturer's Warranty for Screw Creep and Durability.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work as indicated in this section with at least three years of documented experience and approved by manufacturer.

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C. Design Engineer's Qualification: Design structural supports and anchorages under direct supervision of a licensed Structural Engineer experienced in design for this type of Work and licensed in State that Project is located. Engineering information provided shall be signed and verified by licensed Structural Engineer.

D. Environmental: Follow these guidelines:

1. Register system as red list chemical free with the Declare label.
2. Certify components to be halogen/bromine free.
3. Provide a minimum of 25% post-consumer recycled material content for system composite members.
4. Environmental Product Declarations: Provide a product-specific EPD Type III report in accordance with EN 15804 and ISO 14025.

1.10 DELIVERY, STORAGE, AND HANDLING

A. See Division 01 Section "Construction Waste Management and Disposal" for material waste requirements.

B. Deliver materials to site without damage or deformation in manufacturer's original unopened containers and with labels that clearly identify product name and manufacturer.

C. Storage: Store materials in clean, dry, and level interior or exterior areas for limited duration in accordance with manufacturer's written instructions.

D. Protect components during transportation, handling, and installation from moisture, excessive temperatures, and other construction operations in accordance with manufacturer's written instructions.

E. Handle components in accordance with manufacturer's written instructions and in a manner to prevent bending, warping, twisting, and surface, edge, or corner damage.

1.11 FIELD CONDITIONS

A. Weather Limitations: Only proceed with installation when existing and forecasted weather conditions allow for assembly of the Work of this Section in accordance with manufacturer's written installation instructions.

1.12 WARRANTY

A. Manufacturer's Warranty for the Sub-Framing System: Provide five (5)-year manufacturer's warranty for CMH sub-framing support system commencing on the date of manufacture or date of substantial completion.

B. FRP Manufacturer's Warranty for Screw Creep and Durability: Provide 20-year manufacturer's non-prorated, product replacement warranty against fastener creep and/or decreased fastener retention capacity for cladding fasteners that are anchored solely into an FRP substrate in lieu of a metal substrate. FRP material to be warrantied to perform long term to retain fasteners in a load capacity equivalent to 16 gauge steel under the same loading, temperature, duration, and durability.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide system tested in accordance with ASTM E330/E330M and certified to be without permanent deformation or failure of structural members in accordance with design wind velocities for project location and potential for occurrence based on data from wind velocity maps and other provisions of ASCE 7 and as approved by authorities having jurisdiction (AHJ).

1. Provide finite element analysis (FEA) to model and evaluate areas of the longest composite girt cantilever span possible between intermediate framing members/attachment.

a. Include maximum dead load and wind load conditions.
b. Include point loads representative of fastener locations.
c. Calculated maximum directional stresses in model using a safety factor of 4 or greater.
d. Indicate and analyze stresses in 3 directions.
e. Provide analysis that accurately replicates the wall system and physical loading dynamics.
f. Submit report as part of the informational submittal.

B. System Thermal Design: Ensure that installed continuous insulation and CMH sub-framing support system, and cladding attachment does not have thermal bridging of fasteners or framing that creates a continuous metal path from exterior surface of insulation to interior face of insulation.

1. Verify that system thermal design meets or exceeds project's thermal design requirements.

a. Thermal Performance Test: Perform tests in accordance with ASTM C1363, corrected to 15 mph wind outside and still air inside, with installed condition including fasteners and joints.
b. Provide efficiency of no less than 93 to 98 percent, with a maximum temperature differential of 18 degrees F from interior wall surface to interior wall cavity and node locations with a 70 degrees F exterior to interior wall temperature delta.
c. Provide test unit with at least one insulation panel horizontal and vertical joint length and height of test chamber area.

C. Temperature Range: Comply with structural loading requirements within a temperature range of minus 55 degrees F to 180 degrees F.

D. Fire-Resistance Ratings: Provide CMH sub-framing support system with fire testing in accordance with ASTM E119 test methods and applied by approved testing agency acceptable to authorities having jurisdiction (AHJ).

1. Surface Burning Characteristics: Test in accordance with ASTM E84 test method for continuous insulation, CMH, and interior surfaces as follows:

a. Flame Spread Index (FSI): 25 or less.
b. Smoke Developed Index (SDI): 450 or less.

2. Immediate Scale Multistory Fire Test: Comply with NFPA 285 and/or IBC acceptance criteria for wall height above grade and fire separation distances when wall type and other noted conditions require such testing or compliance with requirements as indicated.

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E. Fastener Creep and Durability Test: For fasteners anchored into an FRP substrate without metal backer/retention system, perform testing per ASTM D7332-B, seven (7) day continuous fastener loading at the project's specified high service temperature of 180 degrees F.

1. Perform the fastener thread pull-out test for self-drilling screws anchored solely into an FRP substrate. Test with ASTM D7332-B fixture using a fixture with a clearance opening of 34mm (1.313") in diameter. Attach pulling yoke to the fastener head, with the load transferring into the anchoring threads. Ramp loading for no less than 30 seconds and no more than 120 seconds.
2. Perform testing inside a climate chamber at a temperature of 180 degrees F for a period of 7 days at ultimate fastener load. Passing load values to be considered ultimate pull-out values for project engineering purposes.
3. Test for 5 samples at same loading and temperature without pull-out. Certify testing using an independent qualified 3rd party entity.
4. Test results of fastener head/thread pull-through performed at room temperature with static ASTM D7332-B are not considered valid for creep and durability testing and are not to be used for determining ultimate screw loading values.

2.2 MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following:

1. Advanced Architectural Products (A2P).

B. Basis of Design Products: GreenGirt Delta Adjustable System.

2.3 GENERAL SYSTEM DESCRIPTION

A. CMH sub-framing support system components are fabricated to attach through exterior sheathing into metal stud framing, as indicated on Drawings.

B. Fabricate butt joints (non-interlocking joints) of adjacent girts to be installed on a minimum surface width of 3 inches or at double stud condition to accommodate proper fastener margins to composite.

C. If necessary, metal hat channel may be mounted horizontally to vertical CMH sub-framing support system, connecting adjacent supports in series to each other.

2.4 CMH ADJUSTABLE SUPPORT SYSTEM

A. CMH Adjustable Support System: Provide CMH support bracket system consisting of polyester resin matrix with recycled materials, fire retardant additives and reinforced with integral continuous metal inserts the full length with pre-drilled holes to align with substrate fastener locations.

1. Provide vertical application for cladding attachment.
2. Depth of CMH Support Bracket: As indicated on Drawings.
3. Overall System Depth: As indicated on Drawings.
4. Spacing of CMH Support Bracket for Attachment to Substrate:

    a. HZ Spacing: 16 inches on center.
    b. Vertical Spacing: 16 inches on center.

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5. Fastener Retention System: Provide galvanized steel insert for engagement of fasteners, at least 16 gauge thick, with G90 galvanized coating in accordance with ASTM A653/A653M.

    a. Fasten CMH bracket to substrate structure through steel insert located within bottom of CMH bracket.
    b. Insert appropriately sized dual grip retention clip into bottom of CMH bracket.

6. Insert appropriate clip or rail within CMH bracket.
7. Tensile Properties: Engineered lengthwise and crosswise tensile properties of CMH support bracket comply with performance loading criteria and specified safety factors in accordance with ASTM D638.

    a. Lengthwise 50,000 psi and crosswise 40,000 psi, minimum.

8. Compressive Properties: Engineered lengthwise and crosswise compressive properties of CMH support bracket comply with performance loading criteria and specified safety factors in accordance with ASTM D641/D6641M.

    a. Lengthwise 50,000 psi and crosswise 30,000 psi, minimum.

9. Flexural Properties: Engineered lengthwise and crosswise flexural properties of CMH support bracket comply with performance loading criteria and specified safety factors in accordance with ASTM D790.

    a. Lengthwise 50,000 psi and crosswise 40,000 psi, minimum.

10. Modulus of Elasticity: CMH support bracket is engineered to meet performance loading criteria and specified safety factors in accordance with ASTM D638.

    a. Lengthwise 3,000,000 psi and crosswise 3,300,000 psi, minimum.

11. Water Absorption: CMH support bracket absorbs less than 0.46 percent by weight within 24 hours when tested in accordance with ASTM D570.
12. Coefficient of Linear Thermal Expansion: CMH support bracket is at 7.0 x 10^{-6} inch/inch/degrees F when tested in accordance with ASTM D696.
13. Notched Izod Pendulum Impact Resistance, Lengthwise: CMH support bracket is at 160 ft lbs/inch when tested in accordance with ASTM D256 within standard temperature range.
14. Notched Izod Pendulum Impact Resistance, Crosswise: CMH support bracket is at 100 ft lbs/inch when tested in accordance with ASTM D256 within standard temperature range.
15. Barcol Hardness: 45, in accordance with ASTM D2583.

2.5 COMPOSITE METAL HYBRID (CMH) TRIM

A. CMH Trim: Provide nonstructural trim at rough openings to properly transition continuous insulation (CI) system.

    1. Use angled and flat trim to enclose CI system and to provide thermally broken transitions within wall assemblies.

        a. Angled Trim: As indicated on drawings.
        b. Flat Trim: As indicated on drawings.

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2. Use sealant and tapes as required to transition weather-resistive barriers (WRB) from substrate onto trim.
3. Trim to provide 90-degree transition of CI substrate for weather-resistive barriers (WRB) and exterior flashing.
4. Cover trim with exterior panel assembly and flashings.
5. Comply with fire-resistance requirements, as indicated on drawings, and as part of an exterior non-load-bearing exterior wall assembly, tested in accordance with NFPA 285.
6. Water Absorption: Less than 0.46 percent by weight, within 24 hours, tested in accordance with ASTM D570.

2.6 ACCESSORIES

A. Provide necessary accessories for complete installation of CMH sub-framing support system.

B. Fasteners: Corrosion-resistant, self-tapping, and self-drilling screws, bolts, nuts, and other fasteners as recommended by CMH sub-framing support system manufacturer for CMH materials and other project applications.

1. Cladding to CMH: Use standard self-tapping metal screws.
2. CMH to Metal Stud Wall Framing: Use standard self-tapping metal screws.
3. CMH to Concrete or Concrete Masonry Units (CMU): Use standard masonry or concrete screw anchors in pre-drilled hole.
4. CMH to Wood Stud Wall Framing: Use standard wood screw anchors.
5. Use of powder, air, or gas-actuated fasteners or actuated fastener tools is not permitted.
6. Use of impact wrenches when fastening to or from CMH is not permitted.
7. Follow guidelines of ASCE Structural Plastics Design Manual for CMH attachments:

	Ratio of distance to fastener diameter
	Minimum Distance Allowable
Edge distance- end	3.0
Edge distance- side	2.0

C. Tape (if necessary): Pressure-sensitive adhesive-coated polypropylene woven fabric. Furnish tape that is mold, water, tear, and UV resistant, and applicable in a wide temperature range (down to minus 20 degrees F).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas of this work, and project conditions with installer present for compliance with requirements for installation tolerances, substrates, CMH sub-framing support system conditions, and other conditions affecting performance of this Work.

B. Examine structural wall framing to ensure that angles, channels, studs, and other structural support members have been installed within alignment tolerances in accordance with installation instructions of CMH sub-framing support system manufacturer.

C. Examine components and systems penetrating CMH sub-framing support system prior to installation during rough-in stage of construction to coordinate actual locations of penetrations relative to CMH sub-framing support system's joint locations.

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D. Verify that mechanical and electrical-related installations for exterior walls have been completed and verify that adjacent materials and finishes are dry and ready for insulation installation.

E. Proceed with installation of CMH sub-framing support system only after wall substrate surfaces have been properly prepared and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare substrate surfaces using methods recommended in writing by CMH sub-framing support system manufacturer to achieve excellent results under project conditions.

C. Prepare sub-framing, base angles, sills, furring, and other CMH sub-framing support system components and provide anchorage in accordance with ASTM C754 for substrate and wall cladding types in accordance with manufacturer's installation instructions.

3.3 INSTALLATION

A. Install CMH sub-framing support system in accordance with manufacturer's installation instructions.

B. Install CMH sub-framing support system to meet requirements of ASCE Structural Plastics Design Manual.

C. Install system to fill-in exterior spaces without gaps or voids, and do not compress insulation panels.

D. Trim insulation neatly to fit spaces and insulate miscellaneous gaps and voids.

E. Fit insulation tight in spaces and tight to exterior side of Mechanical/Electrical services within plane of insulation.

F. Seal gaps, voids or penetrations completely with approved expandable foam sealant on exterior and interior (if visible) before enclosing wall.

G. Provide spray foam to seal metal penetrations, including cantilevered fasteners, to prevent interstitial space condensation.

H. Protect exposed insulation from open flame and keep dry at all times.

I. Exterior wall insulation panels are not intended to be left exposed for periods of time to excess of 60 days without adequate protection.

    1. When extended exposure is anticipated, protect exposed insulation surfaces including corners, windows and door openings with a compatible waterproof tape.

J. Install CMH sub-framing support system in compliance with system orientation, sizes, and locations as indicated on drawings.

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3.4 TOLERANCES

A. Shim and align CMH sub-framing support system with installation tolerances of ¼ inch in 20 feet, non-cumulative, level, plumb, and aligned with locations as indicated on drawings.

3.5 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Ensure that insulation panels are not exposed to moisture.

1. Remove wet insulation panels or allow them to completely dry prior to installation within CMH sub-framing support system.

C. Replace damaged insulation prior to Date of Substantial Completion.

END OF SECTION 070543

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SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Modified bituminous sheet waterproofing.
2. Blindside sheet waterproofing.

C. Related Requirements:

1. Division 07 Section "Crystalline Waterproofing" for crystalline waterproofing.
2. Division 07 Section “Thermal Insulation.”
3. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashing and trim that interfaces with waterproofing.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including:

a. Surface preparation.
b. Substrate condition and pretreatment.
c. Minimum curing period.
d. Forecasted weather conditions.
e. Special details and sheet flashings,
f. Waterstops, seals and other details.
g. Insulation.
h. Drainage panels.
i. Installation procedures.
j. Testing and inspection procedures.
k. Protection and repairs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. 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 and details of substrate joints and cracks, expansion joints, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions at grade, below grade, and at transitions to other waterproofing systems including membrane air barriers.

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C. Samples: For each exposed product and for each color and texture specified, including the following products:

1. 8-by-8-inch (200-by-200-mm) square of waterproofing and flashing sheet.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Research Reports: For modified bituminous sheet waterproofing/termite barrier, showing compliance with ICC AC380.

C. Product Test Reports: For waterproofing, based on evaluation of comprehensive tests performed by a qualified testing agency.

D. Certifications: Submit Certification signed by the Contractor and the Installer of the waterproofing system stating that the installed materials conform to the specified requirements and that the system was successfully checked and tested prior to covering.

1. Letter from manufacturer certifying that the waterproofing system resists the contaminants indicated in the environmental report.

E. Log Expiration Dates: Keep a log of manufacturing dates for self-adhering sheet waterproofing membrane on the project. Verify shelf life expiration prior to installation. Do not install membrane that has expired shelf life.

F. Field quality-control reports.

G. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is approved or licensed by selected waterproofing manufacturers, with a minimum of three self-adhering sheet waterproofing installations performed over that last 5 years similar in material, design and extent to that indicated for the Project with successful in service results.

1. Selected firm shall employ installers and supervisors who are trained and approved by waterproofing manufacturer.
2. Selected firm installers and supervisors shall complete work on a mockup in the presence of the Architect and Manufacturer's technical representative.

B. Manufacturer’s Technical Representative: For each system installed, provide the waterproofing manufacturer’s technical advisor (not a sales representative) on site to:

1. Observe first five days of installation, and
2. Observe five (5) other full days of installation; and
3. Inspect completed installations and
4. Provide written acceptance for each completed installation; and
5. Inspect the work during the handover of this project to the Contractor.
6. In addition, after an inspected portion of the waterproofing system is worked upon by other trades or otherwise exposed to damage from the work of other trades, the advisor shall inspect the waterproofing system again, immediately prior to installation of any work,

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including concrete pours, which make portions of the waterproofing system inaccessible for inspection.

7. The Contractor shall provide corrective work recommended by the Manufacturer's Technical Representative prior installing work that makes the waterproofing system inaccessible.

C. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.

1. Build for each typical waterproofing installation including cants, terminations and other accessories to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, and protection.

   a. Size: 100 sq. ft. in area, unless otherwise indicated on Drawings.
   b. Description: Each type of wall installation.
   c. Provide mockups of sample repairs to membrane including tears, voids, and separated lapped seams.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer. Protect stored materials from direct sunlight.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing 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. Manufacturer's Warranty:

1. Waterproofing Warranty: Manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

   a. Warranty Period: Five years from date of Substantial Completion.

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B. Installer's Special Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of two years.

1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pavers on plaza decks.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, and molded-sheet drainage panels from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Minimum 60-mil (1.5-mm) nominal thickness, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated on one side to a 4-mil- (0.10-mm-) thick, polyethylene-film reinforcement, and with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Hydrotech, Inc.
b. Carlisle Coatings & Waterproofing Inc; “CCW MiraDRI 860/861.”
c. CETCO, a Minerals Technologies company.
d. Basis of Design: GCP Applied Technologies Inc. (formerly Grace Construction Products); “Bituthene 4000.”
e. Henry Company; “Blueskin WP 200.”
f. Soprema, Inc.
g. W.R. Meadows, Inc.

2. Physical Properties:

a. Tensile Strength, Membrane: 325 psi (2.24 MPa) minimum; ASTM D412, Die C, modified.
b. Ultimate Elongation: 300 percent minimum; ASTM D412, Die C, modified.
c. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C836/C836M.
d. Puncture Resistance: 50 lbf (222 N) minimum; ASTM E154/E154M.
e. Water Absorption: Less than 0.1 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D570.
f. Water Vapor Permeance: Less than 0.1 perm (5.721 ng/Pa x s x sq. m); ASTM E96/E96M, Water Method.
g. Hydrostatic-Head Resistance: 230 feet (70 m) minimum; ASTM D5385.

3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

B. Mastic, Adhesives, and Detail Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

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2.3 BLINDSIDE SHEET WATERPROOFING

A. Blindside Sheet Waterproofing for Vertical Applications: Uniform, flexible, multilayered-composite HPDE/TPO sheet membrane that forms a permanent bond with fresh concrete placed against it; complete with accessories and preformed shapes for an unbroken waterproofing assembly; with the following physical properties:

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

   a. Carlisle Coatings & Waterproofing Inc; MiraPLY-V.
   b. GCP Applied Technologies Inc.; Preprufe 160R Plus, with Preprufe Tie Back Covers.
   c. Henry Company; a Carlisle company; Blueskin PreSeal 320.

2. Physical Properties:

   a. Thickness (nominal): 0.032 inch (0.5mm) minimum, ASTM D3767
   b. Tensile Strength, Film: 1500 psi (27.6 MPa) minimum; ASTM D412 or D882.
   c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D1970/D1970M.
   d. Peel Adhesion to Concrete: 5 lbf/in. (875 N/m) minimum; ASTM D903, modified.
   e. Lap Adhesion: 5 lbf/in. (875 N/m) minimum; ASTM D1876, modified.
   f. Hydrostatic-Head Resistance: 230 ft. (70 m); ASTM D5385/D5385M, modified; pass at 100 psi.
   g. Puncture Resistance: 100 lbf (445 N) minimum; ASTM E154/E154M.
   h. Water Vapor Permeance: 0.1 perm (6 ng/Pa x s x sq. m) maximum; ASTM E96/E96M, Water Method.
   i. Ultimate Elongation: 335 percent minimum; ASTM D412, modified.
   j. Water Absorption: 0.5 percent maximum; ASTM D570.

B. Blindside Sheet Waterproofing for Horizontal Applications: Uniform, flexible, multilayered-composite HPDE/TPO sheet membrane that forms a permanent bond with fresh concrete placed against it; complete with accessories and preformed shapes for an unbroken waterproofing assembly; with the following physical properties:

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

   a. Carlisle Coatings & Waterproofing Inc; “MiraPLY-H.”
   b. Basis of Design: GCP Applied Technologies Inc. (formerly Grace Construction Products); “Preprufe 300R-Plus.”
   c. Henry Blueskin PreSeal 435

2. Physical Properties:

   a. Thickness (nominal): 0.046 inch (0.5mm) minimum; ASTM D3767.
   b. Tensile Strength, Film: 1900 psi (27.6 MPa) minimum; ASTM D412.
   c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D1970/D1970M.
   d. Peel Adhesion to Concrete: 5 lbf/in. (875 N/m) minimum; ASTM D903, modified.
   e. Lap Adhesion: 5 lbf/in. (875 N/m) minimum; ASTM D1876, modified.
   f. Hydrostatic-Head Resistance: 230 ft. (70 m); ASTM D5385/D5385M, modified.
   g. Puncture Resistance: 200 lbf (890 N) minimum; ASTM E154/E154M.
   h. Water Vapor Permeance: 0.1 perm (6 ng/Pa x s x sq. m) maximum; ASTM E96/E96M, Water Method.
   i. Ultimate Elongation: 70 percent minimum; ASTM D412, modified.
   j. Water Absorption: 0.6 percent maximum; ASTM D570.

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C. Mastic, Adhesives, and Detail Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

2.4 AUXILIARY MATERIALS

A. 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 sheet waterproofing material manufacturer.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet waterproofing material manufacturer.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

F. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.

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.

H. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch, predrilled at 9-inch centers.

I. Protection Course: ASTM D6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Thickness: Nominal 1/8 inch for vertical applications; 1/4 inch elsewhere.
2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.

J. Tie-Back Boot: Preformed tie-back cover or field fabricated galvanized sheet metal tie-back covers.

2.5 MOLDED-SHEET DRAINAGE PANELS

A. Molded-Sheet Drainage Panel with Polymeric Film, Nonwoven-Geotextile Faced: Composite subsurface drainage panel acceptable to waterproofing manufacturer and consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21 mm) sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate through the core of 9 to 21 gpm per ft. (112 to 261 L/min. per m).

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

    a. Sika Corporation, American Hydrotech, Inc.; Hydrodrain 400.
    b. Carlisle Coatings & Waterproofing Inc; CCW MiraDRAIN 6200XL for vertical walls and CCW MiraDrain 9800 for underslab/horizontal applications.
    c. GCP Applied Technologies Inc.; Hydroduct 220 for vertical walls and Hydroduct 660 for underslab/horizontal installation.
    d. Henry Company; a Carlisle company; Comparable products.

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 waterproofing.

1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D4263.
3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.
4. Remove loose aggregate or sharp protrusions. Remove standing water prior to application of membranes.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 D4258.

1. Install sheet strips of width according to manufacturer's written instructions 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 of widths according to manufacturer's written instructions.

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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 in accordance with manufacturer's instructions.

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 in 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 D6135 and manufacturer's written instructions.

3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and per recommendations in ASTM D6135.

B. Apply primer to substrates at required rate and allow it 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- (64-mm-) 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 (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

D. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

E. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

F. Seal edges of sheet-waterproofing terminations with mastic, and seal exposed edges not concealed by metal counterflashings or ending in reglets with mastic.

G. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.

H. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.

I. Install sheet waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.

J. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches (150 mm) beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.

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K. Immediately install protection course with butted joints over waterproofing membrane.

L. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.4 BLINDSIDE SHEET-WATERPROOFING APPLICATION

A. Install blindside sheet waterproofing according to manufacturer's written instructions.

B. Place and secure drainage panels over substrate. Lap edges and ends of geotextile to maintain continuity.

C. Vertical Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation. Mechanically fasten to substrate.

1. Securely fasten top termination of membrane with continuous metal termination bar anchored into substrate and cover with detailing tape.

D. Horizontal Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation.

E. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.

F. Seal penetrations through sheet waterproofing in accordance with manufacturer's recommendations to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.

1. Tie-Back Heads: Cut and secure sheet waterproofing to fit tightly around all tie-back heads. Install preformed tie-back boot over tie-back heads and other retaining wall anchorage. Flash and seal according to manufacturer's written instructions.
2. Pipe Penetrations: Cut and secure sheet waterproofing to fit tightly around pipe penetrations. Flash and seal according to manufacturer's written instructions.

G. Install self-adhering sheet waterproofing over blind side waterproofing with a minimum overlap of 6 inches.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches beyond repaired areas in all directions. Apply a patch of sheet membrane and firmly secure with detail tape.

I. Correct deficiencies in or remove waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.

3.5 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use manufacturer recommended adhesives compatible with both the membrane and the molded sheet drainage panel to secure insulation drainage panels on self-adhered membrane waterproofing. Do not use fasteners or

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other items that may penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical applications, install protection course before installing drainage panels.
2. Install molded-sheet drainage panels with the plastic core towards the concrete foundation wall and the filter fabric towards the excavation support system.
3. Start installation at the bottom of the wall. Cut to fit around tie-back heads, wall penetrations, and other conditions. Install molded-sheet drainage panels to within 6 inches below the finished grade line.

B. Connections to Subdrainage Systems: Install according to manufacturer's written instructions for outlet pipe connectors and detail tape.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent quality control inspecting, and testing agency approved by the manufacturer to perform tests and furnish reports to Architect. Cooperate with the independent agency to ensure quality control of the installation.

1. Quality assurance will include seam pull tests and temperature tests of each gun/automatic machine at the start of each operational phase.
2. Field Adhesion Results:
    a. For non-blindside waterproofing, perform field adhesion test per ASTM D903 on samples of installed membrane, and lap adhesion test per ASTM D1876 on samples of field laps to verify that field installation complies with performance criteria specified.
        1) Shop testing for peel and lap adhesion evidencing compliance with specified performance will be accepted in lieu of field testing provided that actual test reports no older than 5 years are submitted for review during shop drawings.
3. Field Seams: Inspection of the field seams to assure manufacturer's quality requirements are maintained throughout the installation period. Each field seam shall be 100% inspected and a written report prepared by the testing agency shall be submitted.

B. The testing agency shall inspect and report on membrane adhesion to the substrate including inspection of inside and outside corners field seams and to assure manufacturer's quality requirements are maintained throughout the installation period.

1. Prepare test and inspection reports.
2. Provide ‘sealant lot number’ as part of recorded item in the ‘Field-Adhesion-Test’ log.
3. It is a requirement to keep a log of manufacturing date for all self-adhered sheet waterproofing used on the project and submit the log at substantial completion.
4. Prior to installation, verify that self-adhered sheet waterproofing used on the project has not exceeded the manufacturer's recommended product shelf life. Do not use waterproofing membranes with expired dates.

C. Evaluation of Field Results

1. Waterproofing not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory.
2. Waterproofing will be considered defective if it does not pass tests and inspections.
3. Remove self-adhered sheet waterproofing that fail to adhere to substrates or to comply with other requirements.

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D. Manufacturer's Field Service: Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components; and to furnish daily reports to Architect.

E. Representative shall be present at preinstallation conference and at start of waterproofing activities.

3.7 PROTECTION, REPAIR, 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. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 071326

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SECTION 071616 – CRYSTALLINE WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Crystalline waterproofing for application on interior surfaces of elevator pit and other applications indicated on Drawings.

C. Related Requirements:

1. Division 03 Section "Cast-in-Place Concrete" for waterstops, concrete work, and the finishing of concrete walls and slabs to receive waterproofing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, substrate preparation, and installation instructions.

B. Shop Drawings: Show locations and details of waterproofing preparation and application.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Applicator.

B. Field Quality-Control Reports.

C. Warranty.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: A firm approved by the waterproofing manufacturer with a minimum of 5 year successful experience 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.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original containers with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, shelf life, 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.

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1.6 FIELD 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 with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed. 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 degrees F (4.4 degrees C) or above during work and cure period, and space is well ventilated and kept free of water.

1.7 WARRANTY

A. Special Manufacturer's Warranty: Written warranty, signed by the Applicator and countersigned by the Contractor agreeing to repair or replace waterproofing material that does not comply with requirements or that fails to perform as required, and to maintain watertight conditions within specified warranty period. Warranty includes responsibility for removing and replacing other work that conceals crystalline waterproofing. During warranty period, repairs and replacements required because of unusual weather phenomena and other events beyond Contractor's or Applicator's control shall be completed by Contractor or Applicator and paid for by Owner at prevailing rates.

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

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Sole Source Responsibility: Obtain crystalline waterproofing from one source of a single manufacturer. Obtain compatible patching and plugging compounds from the manufacturer or from sources acceptable to the manufacturer. Where crystalline waterproofing interfaces with other waterproofing systems, provide compatible systems to ensure continuity of waterproofing at transition details. Follow manufacturer's details and technical notes regarding detailing required at these transitions.

2.2 WATERPROOFING MATERIALS

A. Crystalline Waterproofing: Prepackaged, 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; with properties complying with 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.”

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c. Master Builders Solutions, MBCC Group; Construction Systems; “MasterSeal 500.”
d. Basis of Design: Vandex USA LLC; “Vandex Super/Super White.”
e. Xypex Chemical Corporation; “Xypex.”

2. Water Permeability: Maximum zero for water at 30 feet (9 m) when tested according to COE CRD-C 48.
3. Compressive Strength: Minimum 4,000 psi (27.6 MPa) at 28 days when tested according to ASTM C109/C109M.

2.3 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; and compatible with substrate and other materials indicated.

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); and 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. Polymer Admixture for Protective Topping: Polymer bonding agent and admixture designed to improve adhesion to prepared substrates and not to create a vapor barrier.

F. Water: Potable.

2.4 MIXES

A. Crystalline Waterproofing: Add prepackaged dry ingredients to water according to waterproofing manufacturer's written instructions. Mix together with mechanical mixer or by hand to required consistency.

B. Protective Topping: Measure, batch, and mix portland cement and sand in the proportion of 1:3 and water. Blend together with mechanical mixer 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. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.

C. Examine surfaces to be waterproofed for form tie holes and structural defects such as honeycombing, rock pockets, faulty construction joints and cracks. Such defects to be repaired in accordance with manufacturer’s product data.

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D. Substrate Acceptance: Proceed with application only after unsatisfactory conditions have been corrected. Commencement of crystalline waterproofing application constitutes substrate acceptance.

E. Notify Architect in writing of active leaks or defects that would affect system performance.

3.2 PREPARATION

A. Comply with waterproofing manufacturer's written instructions for preparation of substrates.

B. 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.

C. 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.

D. Stop active water leaks with plugging compound.

E. Repair damaged or unsatisfactory substrate with patching compound.

1. Remove fins, ridges, and other projections.
2. At holes and cracks 1/16 inch (1.6 mm) wide or larger in substrate, remove loosened chips and cut reveal with sides perpendicular to surface, not tapered, and minimum 1 inch (25 mm) deep. Fill reveal with patching compound flush with surface.

F. Surface Preparation: 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 D4258.

    a. Scratch- and Float-Finished Concrete: Etch with 10 percent muriatic acid solution according to ASTM D4260.
    b. Smooth-Formed and Trowel-Finished Concrete: Prepare by mechanical abrading or abrasive-blast cleaning according to ASTM D4259.

2. Concrete Joints: Clean reveals.

3.3 APPLICATION

A. General: Comply with waterproofing manufacturer's written instructions for application and curing.

1. Saturate surface with water for several hours and maintain damp condition until applying waterproofing. Remove standing water.
2. Apply waterproofing to elevator pit surfaces and extend waterproofing onto adjacent surfaces as indicated on Shop Drawings.
3. Number of Coats: Minimum number of coats required for specified water permeability but not less than two coats.
4. Application Method: Brush or spray. 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 or brushed.

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C. Curing: Moist-cure waterproofing for three days immediately after final coat has set, followed by air drying, unless otherwise recommended in writing by waterproofing manufacturer.

D. Protective Topping: Apply 1-inch- (25.4-mm-) thick, protective topping over horizontal elevator pit or floor surfaces.

3.4 FIELD QUALITY CONTROL

A. Inspection: Engage a manufacturer-authorized field service representative to test and inspect substrate conditions, surface preparation, initial application and completed application of waterproofing.

1. Prepare test and inspection reports, and furnish to Architect.

END OF SECTION 071616

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SECTION 071710 – HYDROPHILIC WATERSTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Hydrophilic waterstops.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include product specifications and manufacturer's written installation instructions. Include manufacturer’s written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings: Include details for waterstops at concrete foundation wall construction joints, block-outs, and wall penetrations, including sleeves.

1. Show installation details indicating minimum concrete cover for waterstops and position of steel reinforcing bars.

C. Samples: For each of the following products, in sizes indicated:

1. Waterstops: 12 inches long.

D. Material Certificates: For hydrophilic waterstops.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain waterstops and adhesives through one source from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original unopened and undamaged containers.

B. Store materials in a dry, well-ventilated space.

1.5 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit waterstops to be installed according to manufacturers' written instructions and warranty requirements.

1. Do not apply waterstops to surfaces where ice or frost is visible.
2. Placing of waterstops on damp surfaces is allowed if approved in writing by manufacturer.

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PART 2 - PRODUCTS

2.1 HYDROPHILIC WATERSTOPS

A. Preformed Hydrophilic Waterstops: Flexible strips of hydrophilic waterproofing compound in coil form; designed specifically for vertical and horizontal joints in concrete construction. Waterstop material shall consist of polyurethane and butyl rubber based material free of sodium bentonite, and shall be a nominal 1 inch by 3/4 inch extruded rectangular shape.

B. Products: Provide one of the following or equal:

1. CETCO; “Akwastop Hydrophilic Rubber Waterstop.”
2. Basis of Design: GCP Applied Technologies Inc. (formerly Grace Construction Products); “Adcor 500S Hydrophylic Waterstop.”
3. Henry; “HF302- Hydro-Flex Waterstop.”

2.2 INSTALLATION ACCESSORIES

A. Adhesive for Hydrophilic Waterstops: Hydrophilic waterstop manufacturer’s recommended non-flammable, latex, water-based adhesive specially formulated to work with hydrophilic waterstops.

B. Fasteners: Case-hardened nails or hardened-steel, powder-actuated fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate preparations affecting performance of waterstops.

1. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate work in the vicinity of waterstops to ensure proper conditions for installing the waterstops.

B. Clean substrate according to manufacturer’s written instructions.

3.3 INSTALLATION, GENERAL

A. Install waterstops and accessories according to manufacturer's written instructions, standard details, and recommended practices. Consult with manufacturer where any special conditions not otherwise covered in printed instructions occur.

B. Provide hydrophilic waterstops at locations waterproofed with self-adhering sheet waterproofing. Refer to Division 07 Section "Self-Adhering Sheet Waterproofing."

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3.4 WATERSTOP INSTALLATION

A. Application: Install waterstops after installation of reinforcing bars, but prior to placing of interior forms and pouring of concrete. Secure waterstops to substrate with manufacturer's recommended adhesive. Mechanical fasteners may be used in conjunction with adhesive.

1. End Joints: Place in maximum practicable lengths to minimize coil end joints. Tightly butt coil ends to form a continuous waterstop. Do not overlap coil ends.
2. Concrete Cover: Place waterstops so that they will be encapsulated with at least 3 inches of concrete on all sides.

B. Static Construction Joints: Install waterstops in all vertical and horizontal construction pour joints in concrete foundation walls and on concrete footings.

C. Sleeved Pipe and Conduit Penetrations: Install waterstop strip around outer diameter of the sleeve. Install another waterstop strip between the sleeve's inner diameter and the pipe or conduit, contacting both surfaces continuously. Completely fill the void area between the sleeve and pipe, or conduit, with non-shrink grout.

D. Pipe and Conduit Penetrations: Install waterstop strip around outer diameter of the pipe and conduit.

E. Protection: Protect waterstops from damage and wetting prior to and during subsequent construction operations.

END OF SECTION 071710

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SECTION 071800 - TRAFFIC COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes but is not limited to:

1. Vehicular traffic coatings.

C. Related Requirements:

1. Division 07 Section "Water Repellents" for penetrating and film-forming water repellents applied on traffic-bearing surfaces.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include installation instructions and details, material descriptions, dry or wet film thickness requirements, and finish.

B. Sustainable Design Submittals:

1. Product Data: For interior coatings wet applied, indicating VOC content.
2. Laboratory Test Reports: For interior coatings wet applied, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For traffic coatings.

1. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions that are not included in manufacturer's product data.
2. Include plans showing layout of pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

D. Samples for Initial Selection: For each type of exposed finish.

E. Samples for Verification: For each type of exposed finish, prepared on rigid backing.

1. Provide stepped Samples on backing to illustrate buildup of traffic coatings.

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1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of traffic coating.

C. Sustainable Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
3. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

D. Field quality-control reports.

E. Sample Warranty: For manufacturer's warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For traffic coatings 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 set quality standards for materials and execution.

1. Build mockup for each traffic coating and substrate to receive traffic coatings.
2. Size: 200 sq. ft. (18.5 sq. m) of each substrate to demonstrate surface preparation, joint and crack treatment, thickness, texture, color, and standard of workmanship.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F (5 deg C), when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F (3 deg C) above dew point.

1. Do not apply traffic coatings in rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.

B. Do not install traffic coating until items that penetrate membrane have been installed.

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1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace traffic coating that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Adhesive or cohesive failures.
b. Abrasion or tearing failures.
c. Surface crazing or spalling.
d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Low-Emitting Materials:

1. Interior coatings wet-applied onsite must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. Interior coatings wet-applied onsite must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4/v4.1 BD+C: New Construction".

B. Source Limitations:

1. Obtain traffic coatings from single source from single manufacturer.
2. Obtain primary traffic-coating materials, including primers, from traffic-coating manufacturer. Obtain accessory materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of types and from sources recommended in writing by primary material manufacturer.
3. Obtain pavement-marking paint from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Material Compatibility: Provide primers; base coat, intermediate coat, and topcoat; and accessory materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

2.3 VEHICULAR TRAFFIC COATING

A. Traffic Coating (**TDC-01**): Extra Heavy Duty, traffic-bearing, seamless, high-solids-content, cold liquid-applied, two component, reactive curing, elastomeric, waterproofing membrane system with integral wearing surface for pedestrian traffic and vehicular traffic service condition; according to ASTM C957/C957M. For exterior application provide U.V.- resistant coating system. Include primer, elastomeric coatings, aggregate, sealants, flashings and other materials for a waterproof, weathertight installation.

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1. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following:

    a. Euclid Chemical Company (The); an RPM company;.
    b. Key Resin Company;.
    c. LymTal International Inc;.
    d. NEOGARD, a Division of Hempel (USA), Inc.
    e. Pecora Corporation;.
    f. POLY-CARB, Inc.
    g. Sika Corporation.
    h. Soprema, Inc.

2. Basis of Design Product:

    a. Sika Corporation “Sikalastic 710/715/736 AL Lo-VOC.”

B. Apply system in accordance with manufacturer's recommendations using the following components:

1. Sikalastic-710 Base: Single-component, elastomeric, crack-bridging, waterproofing base coat.
2. Sikalastic-715 Top: Single-component, elastomeric, traffic-bearing wear coat.
3. Sikalastic-736 AL Lo-VOC: Single-component, aliphatic, low-VOC, traffic-bearing top coat.

C. Top Coat Performance Characteristics:

1. Shore A Hardness: 90 +/- 5 as per ASTM D2240, tested at 75 degrees F (24 degrees C) and 50 percent RH.
2. Tensile Strength: 4000 +/- 300 psi as per ASTM D412, tested at 75 degrees F (24 degrees C) and 50 percent RH.
3. Elongation at BreakL 250 +/- 50 percent as per ASTM D412, tested at 75 degrees F (24 degrees C) and 50 percent RH.

D. Solar Reflectance Index (SRI): Three-year-aged SRI not less than 64 or initial SRI not less than 82 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

2.4 ACCESSORY MATERIALS

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

B. Sheet Flashing: Nonstaining sheet material recommended in writing by traffic-coating manufacturer.

C. Adhesive: Contact adhesive recommended in writing by traffic-coating manufacturer.

D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic-coating manufacturer.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, surface smoothness, and other conditions affecting performance of traffic-coating work.

B. Verify that substrates are visibly dry and free of moisture.

1. Test for moisture according to ASTM D4263.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of traffic-coating work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Begin coating application only after minimum concrete-curing and -drying period recommended in writing by traffic-coating manufacturer has passed and after substrates are dry.
2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. General: Before applying traffic coatings, clean and prepare substrates according to ASTM C1127 and manufacturer's written instructions to produce clean, dust-free, dry substrate for traffic-coating application. Remove projections, fill voids, and seal joints if any, as recommended in writing by traffic-coating manufacturer.

B. Priming: Unless manufacturer recommends in writing against priming, prime substrates according to manufacturer's written instructions.

1. Limit priming to areas that will be covered by traffic-coating material on same day. Reprime areas exposed for more time than recommended by manufacturer.

C. Schedule preparation work so dust and other contaminants from process do not fall on wet, newly coated surfaces.

D. Mask adjoining surfaces not receiving traffic coatings to prevent overspray, spillage, leaking, and migration of coatings. Prevent traffic-coating materials from entering deck substrate penetrations and clogging weep holes and drains.

E. Concrete Substrates: Mechanically abrade surface to a uniform profile acceptable to manufacturer, according to ASTM D4259. Do not acid etch.

1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
2. Remove concrete fins, ridges, and other projections.
3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D4258 "Standard Practice for Cleaning Concrete".

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3.3 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C1127 and manufacturer's written instructions.

B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.

C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.

D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D4258.

1. Comply with recommendations in ASTM C1193 for joint-sealant installation.

B. Apply reinforcing strip in traffic-coating system where recommended in writing by traffic-coating manufacturer.

3.5 TRAFFIC-COATING APPLICATION

A. Apply traffic coating according to ASTM C1127 and manufacturer's written instructions.

B. Apply coats of specified compositions for each type of traffic coating at locations as indicated on Drawings.

C. Start traffic-coating application in presence of manufacturer's technical representative.

D. Verify that wet-film thickness of each coat complies with requirements every 100 sq. ft. (9 sq. m).

E. Uniformly broadcast and embed aggregate in each coat indicated to receive aggregate according to manufacturer's written instructions. After coat dries, sweep away excess aggregate.

F. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated; omit aggregate on vertical surfaces.

G. Cure traffic coatings. Prevent contamination and damage during coating application and curing.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Traffic Coating Subcontractor to engage a qualified testing agency to perform the following field tests and inspections:

1. Materials Testing:

a. Samples of material delivered to Project site shall be taken, identified, sealed, and certified in presence of Owner, Contractor, and Architect.

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b. Testing agency shall perform tests for characteristics specified, using applicable referenced testing procedures.
c. Testing agency shall verify thickness of coatings during traffic-coating application for each 600 sq. ft. (56 sq. m) of installed traffic coating or part thereof.

2. Electronic Leak-Detection Testing:

a. Testing agency shall test each deck area for leaks using an electronic leak-detection method that locates discontinuities in the traffic-coating membrane.
b. Testing agency shall perform tests on abutting or overlapping smaller areas as necessary to cover entire test area.
c. Testing agency shall create a conductive electronic field over the area of traffic coating to be tested and electronically determine locations of discontinuities or leaks, if any, in the traffic coating.
d. Testing agency shall provide survey report indicating locations of discontinuities, if any.

3. If test results show traffic coating does not comply with requirements, remove and replace or repair the membrane as recommended in writing by traffic-coating manufacturer and make further repairs after retesting until traffic-coating installation passes.

B. Final Traffic-Coating Inspection: Arrange for traffic-coating manufacturer's technical personnel to inspect membrane installation on completion.

1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

C. Waterproofing will be considered defective if it does not pass tests and inspections.

D. Additional testing and inspecting, at Subcontractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports, and submit to the Owner, Architect, and authority having jurisdiction.

3.7 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071800

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SECTION 071900 – WATER REPELLENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Penetrating water-repellent treatments for the following vertical and horizontal surfaces:

a. Cast-in-place concrete elements.
b. Cementitious wall panel elements.

C. Related Requirements:

1. Division 03 Section "Cast-in-Place Concrete."
2. Division 07 Section "Cementitious Wall Panels."

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's printed statement of VOC content.
2. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.
3. Include manufacturer's specifications, surface preparation and application instruction.
4. Include manufacturer's recommendations for each surface to be treated, and protection and cleaning instructions.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, sealants and coatings wet applied, indicating VOC content.
2. Laboratory Test Reports: For adhesives, sealants and coatings wet applied, indicating compliance with requirements for low-emitting materials.

C. Samples: For each type of water repellent and substrate indicated, 12 by 12 inches in size, with specified water-repellent treatment applied to half of each Sample.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Applicator.

B. Sustainability Design Submittals:

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1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
3. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

C. Product Certificates: For each type of water repellent.

1. Certification by water repellent manufacturer that products supplied comply with local regulations controlling use of VOCs.

D. Preconstruction Test Reports: For water-repellent-treated substrates.

E. Field quality-control reports.

F. Sample Warranty: For special warranty.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.

B. Certificate of Compatibility: Refer to Section 033000 "Cast-In-Place Concrete", for Contractors option for either moist or chemical curing of slabs to receive water repellents. Chemical curing option requires certificates of compatibility by both water repellent and compound manufacturer, subsequent to water repellent manufacturer's review of curing compound data and samples.

C. Mockups: Prepare mockups of each required water repellent on each type of substrate required to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Locate mockups in locations that enable viewing under same conditions as the completed Work.

   a. Size: 100 sq. ft. each.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:

1. Concrete surfaces and mortar have cured for not less than 28 days.
2. Building has been closed in for not less than 30 days before treating wall assemblies.
3. Ambient temperature is above 40 deg F and below 100 deg F and will remain so for 24 hours.
4. Substrate is not frozen and substrate-surface temperature is above 40 deg F and below 100 deg F.

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5. Rain is not predicted within 24 hours.
6. Not less than seven days have passed since surfaces were last wet.
7. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Applicator agree(s) to repair or replace materials that fail to maintain water repellency specified in "Performance Requirements" Article within specified warranty period.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance: Water repellents shall meet the following performance requirements as determined by testing on manufacturer's standard substrates representing those indicated for this Project.

B. Water Absorption: Minimum 90 percent reduction of water absorption after 24 hours for treated compared to untreated specimens when tested according to the following:

1. Cast-in-Place Concrete: ASTM C642.
2. Precast Concrete: ASTM C642.

C. Water-Vapor Transmission: Comply with one or both of the following:

1. Maximum 10 percent reduction water-vapor transmission of treated compared to untreated specimens, according to ASTM E96/E96M.

D. Water Penetration and Leakage through Masonry: Minimum 90 percent reduction in leakage rate of treated compared to untreated specimens, according to ASTM E514/E514M.

E. Durability: Maximum 5 percent loss of water-repellent performance after 2500 hours of weathering according to ASTM G154 compared to water-repellent-treated specimens before weathering.

F. Chloride-Ion Intrusion in Concrete: NCHRP Report 244, Series II tests.

1. Reduction of Water Absorption: 80 percent.
2. Reduction in Chloride Content: 80 percent.

G. Regulatory Requirements: Comply with applicable rules of pollution-control regulatory agency having jurisdiction in Project locale regarding VOCs and use of hydrocarbon solvents.

H. Low-Emitting Materials:

1. Adhesives, sealants and coatings wet-applied on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.

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2. All adhesives, sealants and coatings wet-applied onsite must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4/v4.1 BD+C: New Construction".

2.2 PENETRATING WATER REPELLENTS (CS-01)

A. Silane, Penetrating Water Repellent: Clear, containing 20 percent or more solids of silanes; with alcohol, mineral spirits, water, or other proprietary solvent carrier; and with 400 g/L or less of VOCs.

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

a. Advanced Chemical Technologies, Inc.; Sil-Act ATS-100 LV.
b. Euclid Chemical Company (The); Baracade Silane 100 C.
c. Evonik Degussa Corp; Protectosil 100.
d. PROSOCO, Inc.; SL100.
e. Sika; Sikagard H 1000.
f. Textured Coatings of America, Inc.; Rainstopper 120W.
g. W.R. Meadows; Pentreat 244-20.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.

1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in three representative locations by method recommended by manufacturer.
2. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
3. Verify that required repairs are complete, cured, and dry before applying water repellent.

B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. New Construction and Repairs: Allow concrete and other cementitious materials to age before application of water repellent, according to repellent manufacturer's written instructions.

B. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions and as follows:

1. Cast-in-Place Concrete and Cementitious Wall Panels: Remove oil, curing compounds, laitance, and other substances that inhibit penetration or performance of water repellents according to ASTM E1857.

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C. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.

D. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.

E. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.

1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

3.3 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Apply coating of water repellent on surfaces to be treated using 15 psi-pressure spray with a fan-type spray nozzle to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated.

1. Cementitious Wall Panels: At Contractor's option, first application of water repellent may be completed before installing units. Mask mortar and sealant bond surfaces to prevent water repellent from migrating onto joint surfaces. Remove masking after repellent has cured.

C. Apply a second saturation coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.4 FIELD QUALITY CONTROL

A. Coverage Test: In the presence of Architect, hose down a dry, repellent-treated surface to verify complete and uniform product application. A change in surface color will indicate incomplete application.

1. Notify Architect seven days in advance of the dates and times when surfaces will be tested.
2. Reapply water repellent until coverage test indicates complete coverage.

3.5 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.

B. Comply with manufacturer's written cleaning instructions.

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END OF SECTION 071900

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SECTION 072150 - SPRAYED ACOUSTICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Sprayed thermal insulation.

B. Related Works and Sections

1. Division 03 Section "Cast-In-Place Concrete."
2. Division 07 Section "Thermal Insulation."

1.3 ACTION SUBMITTALS

A. Manufacturer's Product Data: Submit manufacturer's specifications, including certification to show compliance with requirements of the Contract Documents. Submit literature, clearly indicating conditions of acceptance and methods of applications shall be available on site before, and during, period of application of Work of this Section.

B. Samples: Provide samples, minimum 12" x 12" of sprayed insulation bonded to a piece of rigid board.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency, indicating compliance with performance criteria.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installers performing the Work of this Section must be approved by the manufacturers of the sprayed thermal material and shall also have been in business for a minimum period of (3) years. Firms shall have expertise in installation of thermal/acoustic insulation system specified.

B. Manufacturer's Representative: Manufacturer's technical representative that will be on site to attend the preconstruction meeting, train applicators in installation techniques, accept existing substrate conditions and witness the first installation.

C. Preconstruction meeting: provide agenda for preconstruction meeting one week in advance for review by Contractor and AOR.

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1.6 DELIVERY AND STORAGE

A. Deliver materials to the site in manufacturer's original, unopened packaging, labeled as to trade name, and other identifying date.

B. Storage Materials to be stored on site above ground, in a warm, dry place and either on a concrete floor or a wood platform, protected from weather. Reject and remove from site damaged packages found unsuitable for use.

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

1.7 ENVIRONMENTAL CONDITIONS

A. Comply with manufacturer' written instructions regarding proper temperature, humidity and ventilation during application and curing of sprayed thermal insulation. Perform work only under the conditions stated in the manufacturer's printed application instructions.

B. Provide natural ventilation to properly dry the insulation material during and subsequent to its application.

C. Environmental Limitations: Do not apply sprayed thermal insulation when ambient or substrate temperature is 34 deg F., or lower, unless temporary protection and heat are provided to maintain temperature at or above this level prior to, during, and a minimum of 24 hours after application of sprayed insulation.

D. Ventilation: Ventilate building spaces during and after application and provide complete air exchanges in accordance with manufacturer's instructions. Provide ventilation to allow proper curing of the sprayed insulation during and subsequent to its application.

1. In enclosed areas, ventilation shall not be less than 4 complete air changes per hour.

1.8 SEQUENCING/SCHEDULING.

A. Complete sprayed insulation work on a floor before proceeding to the next floor. Coordinate the scheduling of fire protection work to avoid delays in job progress.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Recycled Content: Building materials shall have an averaged recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content for Project constitutes the following percentages of material:

1. Building Insulation:

a. Mineral wool batt or board; 75%.
b. Fiberglass Batt or board: 25%.

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B. VOC and Emissions Requirements: Paints and coatings, adhesives and sealants, wet applied on site shall comply with:

1. VOC limits (g/L) found in tables in Division 01 Section "Sustainable Design Requirements."
2. Emissions testing criteria of CHPH Standard v1.2-2017.

C. VOC Limits for Specialty Applications: Maximum VOC content for special purpose Contact Adhesive: 250 g/L.

2.2 MANUFACTURER

A. Insulation Type **INS-11**: Spray-applied fiber glass materials held together with cementitious binders to form an acoustic and thermal coating, formulated from inorganic fiberglass with minimum 25% recycled glass (20% post-consumer) content, tested for application over sprayed fireproofing materials. Provide the following

1. BOD: Monoglas Incorporated, “Monoglass Spray-On White Fiber” conforming to ASTM E136 using “Monoglass Liquid Bonding Adhesive”.
2. Alternates: Spray applied mineral wool materials held together with cementitious binders to form and acoustic and thermal coating.

    a. ThermaCoustic Industries International Limited; "TC-417 white glass using TC-417 adhesive
    b. Isolatek, "Cafco Heat-Shield, spray applied thermal and acoustic treatment.

B. Spray-applied materials shall not contain asbestos, and shall exhibit the following properties:

1. Fire Hazard Classification ASTM E84.

    a. Flame Spread: 0
    b. Smoke Developed: 10.

2. Non-Combustibility: ASTM E136 (passes)
3. Smoulder Resistance: CGSB 51-GP-36P
4. Dry Density: ASTM D1622- 2.8 pcf.
5. Thermal Conductivity: ASTM C518 K-Factor 0.25 R-Value = 4.00/in. Per California Bureau of Home Furnishings
6. Noise Reduction Coefficient: ASTM C423-77. NRC - 095 I at 2 inches on Solid Backing
7. Fire Gas Toxicity: University of Pittsburgh ProtocolAir Erosion ASTM E859: No Weight Loss
8. Adhesion/Cohesion: ASTM E736: Passed
9. Fungus & Bacterial Resistance: ASTM G21.

C. Substrate Primers: Manufacturer approved, spray applied, stain blocking primers

D. Bonding Adhesive: Manufacturer's Bonding Adhesive shall be mixed with fresh, clean water to the exact proportions recommended by the manufacturer.

E. Spray Applied Sealer: Spray applied, water soluble, liquid copoly emulsion. Subject to compliance with requirements, provide Monoglass Inc., "InsulSeal" or comparable product, with gray color tint.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all surfaces and conditions to which the Work of this Section is to be applied, with applicator present, for compliance with requirements for bonding, installation clearances and other conditions affecting performance of the Work. Ensure they are adequate to provide a satisfactory application of the specified materials. Report any deficiencies to the Architect.

B. Do not begin work until surfaces to receive sprayed insulation have been inspected by the applicator and are acceptable to receive spray applied insulation.

C. Do not apply spray applied insulation on the underside of metal decks prior to completion of concrete work on the deck. Do not install spray applied insulation to the underside of roof deck until roofing is completely installed and tight, penthouses are complete and mechanical units have been placed and after construction roof traffic has ceased.

3.2 PREPARATION

A. Comply with manufacturer's recommendations for cleaning substrates and sprayed fire resistive materials (SFRM) to receive sprayed thermal insulation. Coordinate with Division 07 Section "Applied Fireproofing" to ensure that materials in this section are compatible with and can be bonded to spray fireproofing.

B. Clean surfaces of substances harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, and that interfere with insulation attachment or impair adhesive bonding. Verify surface bonding and compatibility.

1. Surfaces to receive sprayed thermal insulation shall be free of all petroleum base greases and oils, loose mill scale, rust, poorly adhered paint and other foreign materials that could impair bonding to the surface.
2. Remove dust, loose dirt, foreign material on surfaces to which the Work is to be applied, which could otherwise create a false bond.
3. Contact manufacturer for procedures for handling primed/painted substrates. Verify bond requirements and compatibility of all surfaces to receive thermal insulation materials.

C. Coordinate application with Work of other trades, including ductwork, piping and equipment.

1. Ensure that clips, hangers, supports, sleeves and other attachments are placed prior to application of sprayed insulation.
2. Ensure that ducts, piping, equipment, or other items which would interfere with application of thermal insulation are not positioned until thermal insulation work is completed.

D. Ensure that proper temperature and ventilation is maintained in spaces to receive sprayed on fireproofing.

E. Provide adequate protection to adjacent surfaces from being sprayed by means of drop cloths, polyethylene sheets, or other suitable coverings to prevent overspray from coming into contact with unintended fixtures and surface. Overlap, seal and tape protection at edges to provide continuous protection of surfaces.

1. Close off and seal any duct work in areas where sprayed insulation is being applied.

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3.3 APPLICATION

A. Mix and apply thermal insulation in strict accordance with manufacturer's published recommendations.

B. Spray apply insulation to envelope entire area indicated to receive sprayed thermal insulation. Apply insulation to substrate in sufficient thickness to achieve the required thermal value.

1. Use manufacturer recommended powered spray equipment that produces water-based adhesive to fibers as they discharge from the spray nozzle and produce a uniform thickness insulation layer free of starved spots or other evidence of thin applications of application patterns.
2. Apply insulation to substrate in sufficient thickness to achieve the required thermal value.
3. Apply <**insert thickness**> before tamping to achieve R-value of <**insert R-value**>, and acoustic value specified.
4. Use a one pass application procedure. Do not layer application.

C. [Where thickness exceeds recommended thickness of 5 inches for direct application, provide manufacturer's recommended anchors and reinforcement mesh to hold additional layer of spray applied insulation. Comply with the requirements of tested assemblies for method of attachment, reinforcement and maintenance of thermal rating.]

D. Board tamp surface and apply a clear over spray sealer to the tamped sprayed insulation surface, in accordance with manufacturer's written instructions.

E. Apply spray sealer to the tamped sprayed insulation surface, in accordance with manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Representative. Engage manufacturer's field representative to attend preconstruction meetings, be at the site during installation, to approve substrate and first installation. Engage representative to train installer in installation of product.

B. Engage an independent testing inspection agency to inspect and verify the application of coating system.

1. Verify installed thickness to determine if thickness of installed material complies with requirements.
2. Perform pull test to determine if material meets bond strength specified.

C. Inspection shall be performed at least 24 hours after completion of final application coat.

D. Test results shall be made available to all parties at the completion of each pre-designated area and approval.

3.5 PATCHING

A. Patch and repair spray applied insulation damaged by the work of other trades, at no cost to the Owner.

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3.6 CLEANING AND PROTECTION

A. Remove sprayed thermal insulation overspray from surfaces not required to be insulated.

B. Remove overspray from equipment, materials and surfaces not specifically required to be insulated. Perform all removal work while installed product is still wet. Ensure cleaning is up to industry standards.

C. Broom clean working areas affected by the Work of this Section.

D. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

1. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation
2. Apply protective coating to thickness indicated in manufacturer's coverage chart to tamped insulation after cleaning.
3. Apply vapor barrier to tamped insulation surface in accordance with manufacturer's written instructions.

END OF SECTION 072150

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SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes, but is not limited to:

1. Vapor-permeable, fluid-applied air barriers.

B. Related Requirements:

1. Division 04 Section "Unit Masonry" for embedded flashings.
2. Division 06 Section "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.
3. Division 07 Section "Thermal Insulation" for foam-plastic board insulation.
4. Division 07 Section "Modified Bituminous Sheet Air Barriers."
5. Division 07 Section "Flashing and Trim" for flashings.
6. Division 07 Section "Joint Sealants" for joint-sealant materials and installation.

1.2 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 accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Agenda: Review air-barrier requirements and installation procedures, including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, sequence of installation, special details and sheet flashings, mockups, air-leakage and bond testing and special inspection procedures, air-barrier protection and repair recommendations, and work scheduling that covers air barriers.
2. Attendees: Include installers of other construction connecting to air barrier, including roofing, waterproofing, architectural precast concrete, masonry, sealants, windows, glazed curtain walls, and door frames.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

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B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.
4. Include details of mockups

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer's Technical Representative: For each system installed, provide manufacturer's technical representative on site to observe the first 5 days of installation, observe 5 other full days on installation, inspect completed installations, and provide written acceptance of each completed installation.

B. Qualification Data: For Installer. Provide letter from membrane manufacturer indicating that installer is trained and approved by manufacturer.

C. 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 the barrier.

D. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Manufacturer: Company with full time technical representatives that can attend preinstallation meetings, field testing, first installation and periodically during installation to ensure that installation is acceptable for manufacturer warranty.

B. Installer Qualifications: An entity with a minimum of 5 year successful experience applying specified air barrier materials on projects of equivalent size and scope, and that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer licensed by ABAA according to ABAA's Quality Assurance Program and employing ABAA-certified installers and supervisors on Project.

C. Mockups: Build mockups to set quality standards for materials and execution.

1. Build integrated mockups of exterior wall assembly as indicated on Drawings or if not indicated, 150 sq. ft. (14 sq. m), incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly. Coordinate with Exterior wall Contractor and each of the contractors listed in Summary Paragraph of Division 0, Section "Exterior Enclosure Requirements".

a. Field test mockup in accordance with requirements specified in Part 3 "Field Quality Control".
b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
c. If Architect determines mockups do not comply with requirements, reconstruct

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mockups and apply air barrier until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on field mockups.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. 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 in writing 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.

1.10 WARRANTY

A. Special Warranty: Provide installation warranty with installer's agreement to replace fluid applied air barriers and components that do not comply with requirements, or that fails to remain air tight, watertight, exhibit loss of adhesion, cohesion, do not cure within the specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

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 Performance: Air-barrier assembly and seals with adjacent construction capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration.

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1. Air-barrier assemblies 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. Air-barrier membranes compatible with substrates, including glass faced gypsum sheathing, concrete masonry units, concrete, preservative treated plywood sheathing, and fire-retardant treated cants, blocking, and furring strips.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested according to ASTM E2357.

2.3 FLUID-APPLIED MEMBRANE AIR-BARRIERS, VAPOR PERMEABLE

A. Vapor-Permeable Air Barrier: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 20 mils or thicker over smooth, void-free substrates.

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

   a. Carlisle; Barritech VP.
   b. GCP; Perm-A-Barrier VPL.
   c. Henry, a Sika Company; Air-Bloc 17MR.
   d. W. R. Meadows, Inc; Air-Shield LMP.

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. Vapor Permeance: Minimum 12 perms; ASTM E 96/E 96M, Desiccant Method, Procedure A.
   c. Ultimate Elongation: Minimum 500 percent; ASTM D 412, Die C.
   d. Adhesion to Substrate: Minimum 12 lbf/sq. in. when tested on glass-mat gypsum wall sheathing according to ASTM D 4541.
   e. Fire Propagation Characteristics: Products are part of an approved wall assembly that passes NFPA 285 testing. Coordinate with other wall assembly components for compliance.
   f. UV Resistance: Can be exposed to sunlight for 90 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

A. Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.

C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, 0.0187 inch thick, and Series 300 stainless steel fasteners.

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D. Preformed Silicone Extrusion: 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.

E. Provide joint sealants compatible with membrane and adjacent materials. Comply with requirements in Division 07 Section "Joint Sealants" and recommendation by air barrier manufacturer for intended use.

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 substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates 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, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. 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 material.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. 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.

G. 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.

H. Bridge isolation joints, expansion joints, and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

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3.3 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of preparation coat strip extending a minimum of 3 inches (75 mm) along each side of joints and cracks. Apply a double thickness of air barrier membrane and embed a joint reinforcing strip in preparation coat.

B. Gypsum Sheathing: Ensure joints are filled with sealant as specified in Division 06 Section “Sheathing” and according to ASTM C1193 and air barrier manufacturer's written instructions. Apply first layer of fluid air barrier membrane at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air barrier membrane over joint reinforcing strip.

3.4 INSTALLATION, GENERAL

A. Install materials according to air-barrier manufacturer's written instructions and details and according to recommendations in ASTM D6135 to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous air-barrier membranes produced for low-temperature application. Do not install low-temperature sheet if ambient or substrate temperature is higher than 60 deg F.
2. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.

B. Prepare, treat, and seal inside and outside corners and vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.

3.5 ACCESSORIES INSTALLATION

A. Install transition strips and accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.
3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

    a. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

B. Connect and seal exterior wall air-barrier material 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 as required to provide continuity of air barrier.

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C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

D. 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.

E. Continuity at Wall Openings and Transitions: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply [**transition strip**] [**preformed silicone extrusion**] at transitions between sheathing and edge of slabs, sheathing and CMU backup and at non-moving joints, so that a minimum of 4 inches (100 mm) of coverage is achieved over each substrate. Maintain 4 inches (100 mm) of full contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.

1. Transition Strip: Roll firmly to enhance adhesion.
2. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.

F. Install fluid applied membranes bottom up, in a method recommended by manufacture to shingle and direct water away from openings. Use manufacturer's prefabricated inside and outside corners. Apply 8 in wide air barrier transition strips extending 4 inches onto sides of window frames and 4 inches onto adjacent sheathing substrates. Apply manufacturer's recommended silicone sealant/adhesive to overlap a minimum of 1 inch at junctures between preformed corners and vertical/horizontal transitions. Apply silicone lap sealant over exposed edges and on cavity side of flashing sheet. Verify that overlaps are bonded with silicone and that laps are fully embedded without fishmouths, skips, or misalignments of any kind.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to air barrier with an additional 6-inch- (150-mm-) wide, transition strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction. At fasteners and other penetrations required to support exterior wall panels and skins, apply manufacturer recommended seals necessary to maintain continuity of air barriers.

3.6 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

A. General: Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime

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areas exposed for more than 24 hours.
3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
4. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.

1. Vapor-Retarding, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 40 mils (1.0 mm), applied in one or more equal coats.
2. Vapor-Permeable, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils (0.9 mm), applied in one or more equal coats.

C. Do not cover air barrier until it has been tested and inspected by testing agency.

D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.7 FIELD QUALITY CONTROL

A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program. ABAA audit inspection and testing is performed at the following rate:

1. Up to 10,000 Sq. Ft. of Air Barrier: One audit.
2. 10,000 to 35,000 Sq. Ft. of Air Barrier: Two audits.
3. 35,000 to 75,000 Sq. Ft. of Air Barrier: Three audits.
4. 75,000 to 125,000 Sq. Ft. of Air Barrier: Four audits.
5. 125,000 to 200,000 Sq. Ft. of Air Barrier: Five audits.
6. 200,000 Sq. Ft. and Over of Air Barrier: Six audits.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections in compliance with local Energy Code requirements for air sealing and insulation visual inspection.

1. Coordinate with Division 08 Section "Exterior Enclosure System Requirements" for other required testing, and with Division 01 Section "Exterior Enclosure Commissioning" for commissioning of exterior walls.

C. Manufacturer's Representative’s Responsibilities:

1. Present at preinstallation meeting, first installation, and periodically during installation.
2. Providing on-site training of installers for the initial installation crew.

D. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Air-barrier dry film thickness.
3. Continuous structural support of air-barrier system has been provided.
4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and

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mortar droppings.

5. Site conditions for application temperature and dryness of substrates have been maintained.
6. Maximum exposure time of materials to UV deterioration has not been exceeded.
7. Surfaces have been primed, if applicable.
8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
9. Termination mastic has been applied on cut edges.
10. Strips and transition strips have been firmly adhered to substrate.
11. Compatible materials have been used.
12. Transitions at changes in direction and structural support at gaps have been provided.
13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
14. All penetrations have been sealed.
15. Dry film thickness of installed membrane

E. Tests: Perform field testing on the first installation of fluid applied air barriers. Testing requirements will be determined by testing agency from among the following tests:

1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers or using detection liquids.
2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E 783 or ASTM E 2357.
3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. (56 sq. m) of installed air barrier or part thereof. Each test is an average of three pulls within a 3 meter area, with the following conditions requiring additional pull tests:

    a. When there is a crew change during installation.
    b. When there was a weather change that could affect adhesion of air barriers.
    c. If formulation changed (due to weather or other reasons).
    d. If there are multiple substrate types, each substrate requires separate testing.
    e. Frequency of testing may be increased or reduced based on track record of leaks/failures reported by ABAA inspections at the discretion of the Architect.
4. Water Penetration Resistance Testing: Installed Air Barrier Assemblies will be tested for Water Penetration Resistance according to ASTM E 331 for 15 minutes at a test pressure of 137 Pa.

1. Test assembly under AAMA 503:
    a. Perform Air Infiltration testing using Procedure A of ASTM E 783 at a static pressure difference 0.04 cfm/sq. ft. of surface area at 1.57 lb./sq. ft.
    b. Perform Water Penetration Testing using Procedure A of ASTM E1105 at a minimum rate of 5.0 U.S. gal/ft2·h.

F. 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. Document repair/recommendations of Owner's testing agency and manufacturer's representative to use on balance of installations.
3. Remove and replace deficient air-barrier components for retesting as specified above.

G. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

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H. Prepare test and inspection reports.

3.8 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 recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials 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 in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 072726

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SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Standing-seam metal roof panels.

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code.

1.3 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 roof accessories and roof-mounted equipment.
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 structural loading limitations of deck during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.

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7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For standing-seam metal roof panels. 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 system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For standing-seam metal roof panels, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

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B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.8 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.

1.9 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.

1.10 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. 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.

1.11 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:

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a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. VOC and Emissions Requirements: Paints and Coatings, adhesives and sealants, wet applied on site shall comply with:

1. VOC limits (g/L) found in tables in Division 01 Section "Sustainable Design Requirements."
2. Emissions testing criteria of CHPH Standard v1.2-2017.

B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E1680 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).

E. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E2140.

F. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

G. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A- 90.

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2. Hail Resistance: SH.

H. 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 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C), material surfaces.

2.2 STANDING-SEAM METAL ROOF PANELS

A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

1. Basis-of-Design Product: Subject to compliance with requirements, provide, Petersen Aluminum Corporation “PAC-CLAD Snap-Clad Panel.”
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

    a. Nominal Thickness: 22 gauge minimum, and as recommended by manufacturer for project conditions.
    b. Exterior Finish: Two-coat fluoropolymer.
    c. Color: White.

3. Clips: Manufacturer’s standard, designed to accommodate thermal movement.

    a. Spacing: As required by system manufacturer to provide for both positive and negative design loads, while allowing for the expansion and contraction of the entire roof system.
    b. 0.0625-inch- (1.587-mm-) thick, stainless steel sheet.

4. Joint Type: As standard with manufacturer.
5. Panel Coverage: 16 inches (406 mm).
6. Panel Height: 2.0 inches (51 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-

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film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 degrees F (116 degrees C); ASTM D1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 degrees F (29 degrees C); ASTM D1970.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275) hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) 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.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual" style “A”. Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.

E. Downspouts: 4” by 4” square, formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

F. Panel Fasteners: Self-tapping screws designed to withstand design loads.

G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

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2. Joint Sealant: ASTM C920; 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.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.5 FABRICATION

A. 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. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. 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 nonexpansion, 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 panel manufacturer for application, but not less than thickness of metal being secured.

2.6 FINISHES

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

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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 unacceptable. 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. Steel Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

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 primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof 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 C754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side

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edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the roof area indicated below:

    a. Roof perimeter for a distance up from eaves of 36 inches (914 mm) beyond interior wall line.
    b. Rake edges for a distance of 18 inches (460 mm).

B. Flashings: Install flashings to cover underlayment to comply with requirements specified in Division 07 Section "Flashing and Trim."

3.4 INSTALLATION OF STANDING-SEAM METAL ROOF PANELS

A. 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.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
2. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.

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4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
5. Watertight Installation:
    a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
    b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
    c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. 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 roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. 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 will be permanently watertight and weather resistant.

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 achieve waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

H. Roof Curbs: Install flashing around bases where they meet metal roof panels.

I. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

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B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 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. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

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SECTION 074213 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Factory-formed concealed-fastener, lap-seam metal wall panels
2. Factory-formed exposed-fastener, lap-seam metal wall panels.

C. Related Sections:

1. Division 05 Section "Cold-Formed Metal Framing" for wall framing, including studs, and bracing.
2. Division 07 Section “Cladding Support Systems” for thermally-broken support system.
3. Division 07 Section " Flashing" for flashing and other sheet metal work that is not part of metal wall panel assemblies.
4. Division 07 Section "Joint Sealants" for installation of joint sealants between metal panel system and adjacent exterior wall systems.

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code.

1.3 DEFINITION

A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight wall system.

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B. Oil Canning: As defined by ASTM A1030, the term “oil canning” is an aesthetic issue, not a structural problem or a defect. Oil canning is a perceived waviness across the flat areas of metal panels. Oil canning is more apparent under shallow cross lighting so its presence is more discernible during certain seasons or times of day. Also, differing thermal forces can create waviness either temporary or sustained as the sun moves across the sky.

C. Sheet Metal Thickness: Minimum thickness of base metal without metallic coatings or painted finishes.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Attendees: Meet with Owner, Architect, Owner's insurer if applicable, formed metal panel Installer, formed 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. Agenda: Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    a. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
    b. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
    c. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
    d. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
    e. Review temporary protection requirements for metal panel assembly during and after installation.
    f. Review of procedures for repair of metal panels damaged during transport and after installation.
    g. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 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. Sustainable Design Submittals:

1. Product Data: Interior sealants and paints wet-applied onsite, indicating VOC content.
2. Laboratory Test Reports: Interior sealants and paints wet-applied onsite, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; project specific interfaces with other systems and components, details of edge conditions, joints, panel profiles, corners,

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anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

a. Distinguish between factory, shop, and field assembled work

2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

D. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.
2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
3. Accessories: 12-inch-long Samples for each type of accessory.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:

1. Wall panels and attachments.
2. Interface with other systems and components.

B. Qualification Data: For Installer and professional engineer.

C. Fabrication Engineering and Design (Delegated Design): Submit comprehensive engineering analysis and Shop Drawings signed and sealed by a qualified Professional Engineer licensed to practice in the project jurisdiction, responsible for their preparation, indicating compliance with performance requirements specified. Submission shall include:

1. Analysis for applicable loads on framing members including backup cold formed metal wall.
2. Analysis for applicable loads on anchors and support system for the project.
3. Structural calculations and details of anchoring system, including type, size, and spacing of fasteners.

D. Sustainability Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Data: For recycled content of product, separately identifying the percentage of pre-consumer (post-industrial) recycled content and percentage of post-consumer recycled content.
3. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
4. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

E. Product Test Reports: For each product, based on evaluation of compression tests performed by a qualified testing agency.

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1. Provide lab test data (performed within 4 years prior to the date of submission) on structural air and water penetration tests per AAMA 509, evidencing compliance with requirements for exterior metal panel rainscreen systems to control water flow within the exterior envelope.

F. Certification for High Performance Organic Finishes: Manufacturer's and fabricator's certification indicating that PVDF coating complies with the Contract Documents and AAMA 2605.

G. Field quality-control reports.

H. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A firm with a minimum of 10 years successful experience installing formed metal wall panels 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 installers and supervisors who are trained and approved by manufacturer for installation of specified formed metal wall panels.

1. Provide list of at least ten completed projects including names of owners, architects and the areas and types of formed metal wall panels for each of these projects.
2. Installer shall have a full time, senior, qualified foreman at the Project site to direct the work of this Section.

B. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the 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 design and installation of metal wall panel assemblies that are similar to those indicated for this Project in material, design, and extent

D. Mockups: Prior to installing exterior wall systems, build mockups as part of composite mockup indicated on Mockup Elevation Drawing Sheets. Incorporate exterior wall construction and finish to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Provide materials in this section to create the composite testing mockup indicated.
2. Build mockup of typical metal panel assembly, including corner, supports, attachments, and accessories. Build mockup to full thickness of wall design with supports and attachments.

    a. Include four-way joint for metal panels, with finish for Architect's selection.

3. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.

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4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Repair procedure: Provide a sample panel of minimum 36” x 36” size. Demonstrate repair procedure for scratches, dents and discoloration. Review with Architect and make determination which repair procedures will be acceptable on the project. Repairs will be viewed in natural light, 8 feet from panel and viewed at 60 degree angle.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, formed metal wall panels, and other manufactured items so as not to be damaged or deformed. Package formed metal wall panels for protection during transportation and handling.

B. Unload, store, and erect formed metal wall panels in a manner to prevent bending, warping, twisting, and surface.

C. Store formed metal wall panels as recommended by manufacturer, off the ground and covered with suitable weathertight and ventilated covering. Store formed metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store formed metal wall panels in contact with other materials that might cause staining, corrosion, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.10 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.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish framing and opening dimensions and proceed with fabricating metal wall panels without field measurements. Coordinate wall construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.11 COORDINATION

A. Coordinate formed metal wall panel installation with rain drainage work, flashing, trim, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

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1.12 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.
c. Damage to panel surface that cannot be repaired in the field successfully.

2. Warranty Period: 5 years from date of Substantial Completion.

B. Special Warranty on Formed Metal 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 D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
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 DESIGN CRITERIA

A. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Wind pressures used in the Project design are shown on the Structural Drawings.
3. Other Design Loads: As indicated on Drawings.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Formed metal panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Fabrication Engineering and Design: Engineer metal wall panel assembly, including cladding support systems, cold formed steel framing supports, sheathing, air/water barrier and insulation, to comply with design criteria and performance requirements specified. Provide acomprehensive engineering analysis by a qualified professional engineer, licensed to practice in the state of Florida and responsible for preparation of the design, using performance requirements and design criteria indicated.

C. Low-Emitting Materials:

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1. Interior sealants and paints wet-applied onsite must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. Interior sealants and paints wet-applied onsite must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4/v4.1 BD+C: New Construction".

D. Structural Performance: Provide formed metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592 and as follows:

1. Structural Loads: Engineer, fabricate, and install metal panels to withstand indicated design wind loads, seismic loads, sideway, live and dead loads, structural movement, deflections, and meet specified performance requirements.
2. Rain and Wind Loads: As indicated on Drawings. Pay increased attention to areas subject to increased pressure. Take special care to identify and design for any situation not clearly defined in the design criteria where the Subcontractor believes the geometry of the building may cause increased wind, rain and build-up loads due to vortex or eddy conditions.
3. Dimensional tolerances of building frame and other adjacent construction.
4. Deflection Limits: Design metal wall panel assemblies to withstand test pressures with deflection no greater than l/240 of the span and no evidence of material failure, structural distress, or permanent deformation exceeding 0.2 percent of the clear span.

    a. Test Pressures: 150 percent of inward and outward wind-load pressures.

5. When calculating loads, ensure that the worst combination load cases have been considered.

E. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa),

F. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa),.

G. 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): (67 deg C), ambient; (100 deg C), material surfaces.

H. Coping Performance: Design and test copings for wind resistance in accordance with ANSI/SPRI ES-1, except the basic wind speed shall be determined from IBC Figure 1609.

2.3 PANEL MATERIALS

A. Metal Panel Thickness: Select metal panel thickness and widths to minimize “oil canning” in accordance with the requirements of the SMACNA “Architectural Sheet Metal Manual”. Pay careful attention to the causes of “oil canning” within all the phases of design, fabrication, handling and installation of metal plate panels to reduce its occurrence. Employ industry

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accepted and recognized methods of design, handling, fabrication, and installation to minimize "oil canning" of the metal plate panels.

B. Aluminum Sheet: Tensioned leveled, smooth coil-coated aluminum sheet, ASTM B209 (ASTM B209M), stretcher-leveled standard of flatness, minimum thickness, alloy and temper required to suit forming operations and meet design criteria and structural performance requirements for formed metal panels of larger dimensional sizes.

C. Panel dimensional criteria:

1. Flatness: maximum allowable distortion of 1/32 inch in 24 inches in any direction. Form panel lines and breaks sharp and straight; make all surfaces free from warp or buckle.
2. Panel joints: Joints shall not vary in width more than 1/16th inch over 10 feet.
3. System depth: As indicated on Drawings.

2.4 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.

B. Rib-Profile, Exposed-Fastener Metal Wall Panels (**MTP-02**): Formed with

1. Basis-of-Design Product: Subject to compliance with requirements, provide "7.2 Panel" as manufactured by Peterson Pac-Clad, or comparable product by one of the following:

   a. Alcoa Inc.
   b. Centria.
   c. Fabral.
   d. MBCI a division of NCI Building Systems.
   e. Morin; a Kingspan Group company.

2. Material: Aluminum sheet, 0.032 inch (0. mm) thick, minimum, or as required for specified structural performance.

   a. Surface: Smooth, flat finish.
   b. Exterior Finish: Fluoropolymer.
   c. Color: To be selected from manufacturer's standard range.

3. Rib Spacing: 7.2 inches (183 mm) o.c.
4. Rib Height: 1.5 inches (38 mm).
5. Panel Coverage: 36 inches (914 mm).

2.5 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.

B. Flush-Profile, Concealed-Fastener Metal Wall Panels (**MTP-01**): Formed with vertical panel edges and a flush smooth surface between panel edges; with tight joint between panels.

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1. Basis-of-Design Product: Subject to compliance with requirements, provide “Flush Wall Panel” system installed in vertical orientation, as manufactured by Peterson Pac-Clad, or comparable product by one of the following:

    a. Alcoa Inc.
    b. Centria.
    c. Fabral.
    d. MBCI; a division of NCI Building Systems, L.P.
    e. Morin; a Kingspan Group company.

2. Material: Aluminum sheet, 0.032 inch (0. mm) thick, minimum, or as required for specified structural performance.

    a. Surface: Smooth, flat finish.
    b. Exterior Finish: Fluoropolymer.
    c. Color: To be selected from manufacturer’s standard range.

3. Panel Coverage: 16 inches (406 mm), nominal.
4. Panel Height: 1.375 inches (35 mm).

2.6 MISCELLANEOUS MATERIALS

A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures fabricated of same metal as metal panels.
2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, corners, endwalls, and other conditions indicated on Drawings. Finish flashing and trim with same finish system as adjacent metal panels.

C. Fasteners for Wall Panels: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating.

1. Fasteners for Wall Panels: Self-tapping 410 stainless hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
3. Blind Fasteners: High-strength stainless-steel rivets.
4. For fasteners outside of the Air and Water Barrier, use self-tapping 300 Series stainless steel screws with bimetallic heads equal to Bi-Flex 300 Series stainless steel self-drilling fasteners, designed to withstand loads.

D. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

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1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C920; 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.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

E. Bituminous Coating: Cold-applied asphalt mastic, SSPC paint 12, compounded for dry film thickness of 15 mils (380 µm) per coat.

F. Touchup Paint: Air-dried flouropolymer finish coating in color to match coil-coated finishes. Use same paint as used for panel repair sample in Part 1.

2.7 FABRICATION

A. General: Fabricate and finish formed metal wall panels and accessories at the factory, to greatest extent practicable, 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.

1. Fabricate wall panels with panel stiffeners as required to maintain fabrication tolerances, to withstand design loads, and to minimize oil-canning.

B. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

C. Conceal fasteners and expansion provisions where possible.

D. 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 Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. 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.

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2.8 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 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.

1. Physical damage to panels including dents and scratches are not acceptable.

D. Aluminum Panels and Accessories: Prepare, pretreat, and apply fluoropolymer coating systems to exposed metal surfaces to comply with coating and resin manufacturers' written instructions and the physical properties and coating performance requirements of AAMA 621.

A. Superior-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish system consisting of corrosion inhibitive primer, fluoropolymer color coat and clear fluorocarbon topcoat, complying with AAMA 2605 and AA-C12C42R1x, containing not less than 70 percent PVDF resin by weight in color coat, in not less than 1.2 mils dry film thickness.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color and Gloss: Custom color; match Architect's control Sample.

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, cladding support system, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that studs, and other structural panel support members and anchorage have been installed within alignment tolerances as follows:
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances as follows:

a. Maximum substrate and framing deviations from flat plane acceptable:

1) 1/4-inch in 20 feet (6 mm in 6 m) vertically or horizontally.
2) 1/2-inch (12 mm) across building elevation.
3) 1/8-inch in 5 feet (3 mm in 1.6 m).

b. 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.

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C. Examine panels to verify that panel surfaces are unmarred, smooth, and free from discoloration and scratches. Do not install panels that have been damaged.

D. Examine for out-of-tolerance work and other deficient conditions prior to starting installation of metal panels.

E. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cladding Support System: Install attachment assemblies required to support formed metal wall panels, including miscellaneous panel support members and anchorages according to requirements of Division 07 Section “Cladding Support Systems”, ASTM C754. and metal panel manufacturer's written recommendations.

3.3 METAL PANEL 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. Commence metal panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.
2. Field cutting of metal wall panels by torch is not permitted.
3. Shim or otherwise plumb substrates receiving metal panels.
4. 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.
5. Install screw fasteners in predrilled holes.
6. Locate and space fastenings in uniform vertical and horizontal alignment.
7. Install flashing and trim as metal panel work proceeds.
8. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
9. 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.
10. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

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. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.

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2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Flash and seal panels with weather closures at perimeter of all openings.

E. Watertight Installation of lap seam panel systems:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

3.4 ACCESSORY INSTALLATION

A. 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 wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

B. 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 achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) 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 (25 mm) deep, filled with mastic sealant (concealed within joints).

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.

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C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

D. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements. Remove and replace metal panels where field applied repairs are not acceptable.

1. Scratches longer than 2” and located in the center of the panel are not acceptable for field repairs.

E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films 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. Touchup up exposed edges of field-cut panels with air dried paint materials matching original coil coating.

C. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

D. 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

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SECTION 074247 - ULTRA-HIGH PERFORMANCE CEMENT PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Factory-cast, ultra-high-performance cement (UHPC) solid exterior cementitious wall panels and pre-engineered attachment (system).

C. Related Requirements:

1. Division 05 Section “Cold-Formed Metal Framing.”
2. Division 06 Section “Sheathing.”
3. Division 07 Section “Cladding Support Systems” for thermally-broken support system.
4. Division 07 Section “Thermal Insulation.”
5. Division 07 Section “Air Barriers.”

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code.

1.3 REFERENCES

A. ASTM:

1. ASTM C1186.
2. ASTM C1629.
3. ASTM E84.
4. ASTM E136.
5. ASTM E488/E488M.

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1.4 COORDINATION

A. Coordinate installation of anchorages for cementitious wall panels. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, which are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

B. Schedule installation so attachments are made only to completed walls. Do not support panels temporarily by any means that do not suit structural performance requirements.

C. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Attendees: Meet with Owner, Architect, Owner's insurer if applicable, panel Installer, panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects panels, including installers of doors, windows, and louvers.
2. Agenda: Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

    a. Review methods and procedures related to panel installation, including manufacturer's written instructions.
    b. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
    c. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect panels.
    d. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
    e. Review temporary protection requirements for panel assembly during and after installation.
    f. Review procedures for repair of panels damaged after installation.
    g. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.
    h. Coordinate the work of this Section with the work of other Trades.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including manufacturer’s written installation instructions and recommendations.

1. Include fabrication and installation layouts of panels; interfaces with other systems and components, details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.

    a. Distinguish among factory-, shop, and field assembled work.

2. Accessories: Include details of the flashing, trim, and anchorage, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

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B. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:

a. Leadership Extraction Practices:

1) Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
2) Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.

a) Include statement indicating costs for each product having recycled content.

b. Sourcing of Raw Materials: For products that are responsibly sourced within 100 miles from project site, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.

2. Indoor Environmental Quality, Low Emitting Materials:

a. Laboratory Test Reports: For paints, coatings wet applied on site, indicating testing and compliance with the California Department of Public-Health (CDPH) Standard Method V1.2-2017, using the applicable exposure scenario.
b. Paints, and Coatings: For wet applied on-site products, include printed statement of VOC content, showing compliance with the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016.
c. Adhesives and Sealants: For wet applied on-site products, submit printed statement showing compliance with the applicable chemical content requirements of SCAQMD Rule 1168, effective July 1, 2005, and rule amendment date of October 6, 2017.
d. Alternative tests for VOC above include ASTM D2369-10; ISO 11890 part 1; ASTM D6886-03; or ISO 11890-2.
e. Methylene Chloride and perchloroethylene may not be added to paints, coating, adhesive or sealants

C. Shop Drawings: Show fabrication and installation details for precast architectural UHPC units including the following:

1. Unit elevations, sections, and dimensions. Provide plans with geometry layout, axonometric, and 3-dimensional coordination drawings, to show compliance with design intent
2. Thickness of precast architectural UHPC units.
3. Finishes.
4. Joint and connection details.
5. Erection details.
6. Reinforcing details for typical units including sizes, spacings, thicknesses, and yield strengths of various members.
7. Locations and details of connection hardware attached to structure.
8. Sizes, locations, and details of flex, gravity, and seismic anchors for typical units.
9. Erection sequence for special conditions.
10. Relationship to adjacent materials.
11. Description of loose, cast-in, and field hardware.

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D. Samples: Representative of finished exposed face of solid exterior panels. For each color, texture, and pattern specified, submit a minimum of two samples, each not less than 12 by 12 inches, and of actual thickness showing possible range of color and material characteristics indicative of actual production.

E. Quality Assurance Submittals:

1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.
2. Certificates: Qualification Certificates: Submit certificate indicating compliance with qualification requirements in “Quality Assurance” article.
3. Product certificates signed by manufacturers certifying materials comply with specified performance characteristics and criteria and physical requirements.
4. Manufacturers’ Instructions: Manufacturers’ written installation instructions.
5. Manufacturers’ Field Reports: Manufacturers’ field reports specified herein.

1.7 INFORMATIONAL SUBMITTALS

A. Fabrication Engineering and Design: For cementitious wall panels indicated to comply with performance requirements, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation and licensed in Florida.

1. Include calculations supporting engineering design decisions.
2. Show types, connections, types of reinforcement, types of assembly stiffeners, and other aspects of structural engineering. Indicate location, type, magnitude, and direction of loads imposed on the building structural elements.

B. Sustainability Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Data: For recycled content of product, separately identifying the percentage of pre-consumer (post-industrial) recycled content and percentage of post-consumer recycled content.
3. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
4. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

C. Qualification Data: For fabricator and cementitious wall panel manufacturer.

D. Welding certificates.

E. Mill Certificates: For reinforcing materials.

1.8 CLOSEOUT SUBMITTALS:

A. Operation and Maintenance Data:

1. Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section.
2. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

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1.9 QUALITY ASSURANCE

A. Manufacturer/Fabricator Qualifications: Designated at time of bidding as a PCI certified plant for production of architectural quality precast UHPC elements, and with the following documented experience:

1. A firm with a minimum of 20 years successful experience in Architectural Precast Concrete and 5 Years successful experience in UHPC for other projects similar in scope and complexity.
2. A firm with a minimum of 15 years' experience using 3D modeling software and CNC Machines for the creation of master patterns used to make molds for fabricated components.
3. A firm with an internal quality control program detailing the means and methods necessary to ensure uniform quality of panels throughout the casting and fabrication process.

B. Installer Qualifications: Manufacturer/Fabricator of cementitious wall panels, with a minimum of 5 years' experience having successfully erected 2-D and 3-D Architecturally Shaped UHPC Panels for other projects similar in scope and complexity.

C. Welding Qualifications: Quality procedures and personnel according to the following:

1. AWS D1.6, "Structural Welding Code - Stainless Steel."

D. Sample Panels: After sample approval and before fabricating cementitious wall panels, produce a minimum of two (2) sample panels approximately 16 sq. ft. in area for Architect's review, incorporating full-scale details of architectural features, finish, textures, and transitions.

1. Locate panels where indicated or, in 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 at the manufacturer's plant and one at the Project Site in an undisturbed condition as a standard for judging completed work.
4. Demolish and remove Sample Panels when directed.

E. Range Samples: After sample panel approval and before fabricating panels, produce a minimum of five (5) Sets of range samples, approximately 16 sq.ft. in area, representing the anticipated range of each color and texture on the projects panels.

1. Maintain one set of range samples at manufacture's plant as color and texture approval reference.

1.10 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Build Mockup of each type of panel for review by Architect and Contractor.
    a. Include typical components, attachments to building structure, and methods of installation.
    b. Include opening with returns.
2. Following approval of fabrication at fabricator's shop, transport approved Mockups to the Project Site and install in locations as directed by the Architect.

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3. Build mockups for wall panels including accessories.

    a. Size: 48 inches (1200 mm) long by 60 inches (1800 mm) high.
    b. Include outside corner on one end of mockup.
    c. Include adjacent window and trim

4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Repair procedure: Provide a sample panel of minimum 36” x 36” size. Demonstrate repair procedure for scratches, dents, and discoloration. Review with Architect and make determination which repair procedures will be acceptable on the project. Repairs will be viewed in natural light, 8 feet from panel and viewed at 60-degree angle to panel face.

1.11 DELIVERY, STORAGE AND HANDLING

A. Deliver wall panels and support system components packaged to comply with manufacturers’ requirements and adequately protected from damage during shipment.

B. Protect components from adverse job conditions prior to installation.

C. Protect components from other trades after installation.

D. Panels are to be stored and handled vertically until installed.

E. Store wall panels and support system components on platforms or pallets, covered with tarpaulins or other suitable weather-tight ventilated covering. Store components so that water accumulations will drain freely.

F. Do not store wall panels and support system components in contact with other materials that might cause staining, denting, surface damage or other deleterious effects.

1.12 FIELD CONDITIONS

A. Field Measurements:

1. Verify actual measurements/openings by field measurements before material fabrication, and show recorded measurements on shop drawings.
2. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.13 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of 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.

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b. Deterioration of cementitious and other materials beyond normal weathering.
c. Damage to panel surface that cannot be repaired in the field successfully.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

1. Structural Loads: As indicated below and on Drawings.

   a. Dead Loads: Unit dead loads plus dead loads superimposed on the units.
   b. Live Loads: 250 lbf/sq. ft.
   c. Wind Loads: As indicated on Structural Drawings.

      1) Rain, and Wind Loads Considerations: Pay increased attention to areas subject to increased pressure. Take special care to identify and design for any condition not clearly defined in the design criteria where the Subcontractor believes the geometry of the building may cause increased wind, rain and build-up loads due to vortex or eddy conditions.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Provide cementitious wall panel assemblies that comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Fabrication Engineering and Design: Engineer panel assemblies, including framing supports, as well as sheathing, air/water barrier and insulation to comply with performance requirements specified. Provide a comprehensive engineering analysis by a qualified professional engineer licensed to practice in the State of the project and responsible for preparation of the design, using performance requirements and criteria indicated.

C. Building Code Compliance: Provide products complying with ICC AC493 – Composite, Ultra-High Performance Concrete (UHPC) Panel Systems.

D. Structural Performance: Provide panel systems, soffits, and canopies capable of withstanding the effects of the following loads, based on testing according to ASTM E330:

   1. Structural Loads: Except as modified by requirements specified in this Section, engineer, fabricate, and install panels to withstand design wind loads, seismic loads, sidesway, live and dead loads, structural movement, deflections, and tested performance requirements specified.
   2. Deflection Limits: Withstand test pressures with deflection no greater than 1/240 of the span and no evidence of material failure, structural distress, or permanent deformation exceeding 0.2 percent of the clear span.

      a. Test Pressures: 150 percent of inward and outward wind-load design pressures.

E. Maximum Panel System Deflection: 1/240 of span or less when tested in accordance with positive and negative pressures.

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F. 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 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C), material surfaces.

G. Fire-Resistance Ratings: Comply with ASTM E119; 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.

H. Story Drift: Accommodate design displacement of adjacent stories.

2.3 SYSTEM DESCRIPTION

A. Complete system includes design, fabrication, and installation of the solid exterior wall panels on a cladding support system to provide, in conjunction with wall substrate and air barrier, a weather-tight wall assembly utilizing rain screen principle.

2.4 MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following:

1. ECO Cladding.
2. Envel Façade, Inc.
3. TAKTL.

2.5 ULTRA-HIGH PERFORMANCE CEMENT PANELS (UHCP-XX)

A. Manufacturers: The construction documents are based on the manufacturer and system noted below.

1. Basis of Design Manufacturer and Product: TAKTL “A|UHPC Panel System.”

B. Physical Characteristics:

1. Panel Thickness: 5/8-inch (16-mm) nominal, with thickness variation plus or minus 1/16-inch.
2. Panel Corners: As indicated on Drawings.
3. Panel Weight: 7.375 lb/sq ft, at 5/8-inch thickness with standard texture.
4. Compressive Strength (ASTM C39): 12,000 to 18,000 psi. (95 to 120 MPa).
5. Tensile (splitting matrix prism) Strength (ASTM C496): 2100 psi (14.4 MPa).
6. Water Tightness Test: In accordance with ASTM E1186 Section 11. No water droplet formation allowed.
7. Thermal Expansion (ASTM C531): 5.71E-06 in/in/degree F (0.01 inch per meter at 40 degree temperature change).
8. Flexural Strength (Thin Panel) – Wet (ASTM C1609): Pass, Mean length direction not less than 2,200 lbs./sq in. and width direction 2,200 lbs./sq in.
9. Anchor Pullout Strength (ASTM E488): 10 mm embed in 16 mm thick panel.

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a. Tension (Min. Mean) Peak Load – 700 lbf or greater.
b. Shear (Min. Mean) Peak Load – 800 lbf or greater.

10. Surface Burning Characteristics (ASTM E84):

a. Flame Spread: 0.
b. Smoke Developed: 0.

C. Panel Finishes:

1. Finish exposed, front-facing surface of wall panels as follows, to match approved design reference samples. Fabricate panel faces to be free of joint marks, grain, or other obvious defects.

a. Colors: As indicated on Drawings. Standard and custom colors are required.
b. Standard Through Body Pigment, not to exceed 3%.
c. Texture / Finish: Match Architect's samples.
d. Sealer: As recommended by panel manufacturer.

D. Support Structure System:

1. Aluminum Support Structure:

a. Complete sub-frame assembly to support and anchor wall panels. Anchor aluminum support structure to cladding support system as per manufacturers recommendations and in accordance with project specific structural performance requirements.

2.6 FABRICATION

A. Fabricate wall panels and accessory items in accordance with manufacturers' recommendations and approved submittals.

B. Fabricate panels to finished size, with attachment holes and panel extrusion clips factory-installed.

C. Fabricate panels to profiles, colors and textures per samples and approval selected by the Architect.

PART 3 - EXECUTION

3.1 MANUFACTURERS' INSTRUCTIONS

A. Compliance: Comply with manufacturers' product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2 EXAMINATION

A. Examine cladding support system assembly and project conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance of the Work.

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B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 ERECTION/INSTALLATION

A. Install wall reinforcements, channel cleats, clips, hangers, and other accessories required for connecting wall panels to cladding support system and backup materials per project/façade engineer’s approved design.

B. Provide miscellaneous reinforcement of adhered panel parts and unitized panel parts per manufacturer and installation contractor’s engineer.

C. Lift wall panels and install without damage.

D. Install panels level, plumb, square, and in alignment.

E. Provide temporary supports and bracing as required to maintain position, stability, and alignment of panels until permanent connections are completed.

1. Maintain horizontal and vertical joint alignment and uniform joint width.
2. Remove temporary projecting hoisting devices.

F. When unavoidable, field-cut panels and drill face-fastening anchor holes in accordance with the panel manufacturer’s written directions.

G. Do not field-modify factory-drilled concealed/undercut panel anchor holes.

3.4 CLEANING AND PROTECTION

A. Perform cleaning procedures according to panel manufacturer's written instructions.

B. Clean soiled panel surfaces with non-abrasive cleaners and water, using soft fiber brushes, rags and sponges, and rinse with clean water.

C. Prevent damage to panel surfaces and staining of adjacent material.

END OF SECTION 074247

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SECTION 074293 - SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Metal soffit panels.

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: Metal soffit panels.

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 soffit panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

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2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Soffit Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other soffit panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For soffit panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing soffit panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

C. 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 canopy fascia, soffit as indicated on Drawings; approximately four panels wide by full eave width, including 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.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, soffit panels, and other manufactured items so as not to be damaged or deformed. Package soffit panels for protection during transportation and handling.

B. Unload, store, and erect soffit panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack soffit panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store soffit panels to ensure dryness, with positive slope for drainage of

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water. Do not store soffit panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on soffit panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of soffit panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate soffit panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Soffit at locations indicated on Drawings.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide soffit panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

C. 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.3 MANUFACTURERS

A. Soffit Panels, Suspension System and Trim:

1. ATAS International, Inc.
2. Certainteed, a Saint-Gobain Company.

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3. Longboard Architectural Products.
4. Petersen Pac-Clad, a Carlisle Company.

2.4 METAL SOFFIT PANELS

A. Panel Type **MTP-03**: Linear metal planks for exterior soffit applications.

1. Panel Profile: Extruded type 6065-T5 aluminum fabricated to provide a beveled edge joint between panels when installed.
2. Nominal Size: 6 inches (150 mm) wide by lengths indicated on Drawings.
3. Perforations: Manufacturer's standard pattern.
4. Edge Profile: Manufacturer's standard, shaped to result in a beveled edge joint between panels.
5. Flame Spread: ASTM E1264; Class A (FM).
6. Surface Texture: Smooth.
7. Finish: Woodgrain.

a. Color: As indicated on Drawings.

2.5 MISCELLANEOUS MATERIALS

A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of soffit panels unless otherwise indicated.

1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match soffit panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Provide flashing and trim formed from same material as soffit panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent soffit panels.

C. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

2.6 FABRICATION

A. Fabricate and finish soffit 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. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate soffit panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

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D. 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. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by soffit panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.7 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. Superior-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish system consisting of corrosion inhibitive primer, fluoropolymer color coat and clear fluorocarbon topcoat, complying with AAMA 2605 and AA-C12C42R1x, containing not less than 70 percent PVDF resin by weight in color coat, in not less than 1.2 mils dry film thickness.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color and Gloss: Custom color; match Architect's control Sample.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, soffit panel supports, and other conditions affecting performance of the Work.

1. Examine framing to verify that soffit panel support members and anchorage have been installed within alignment tolerances required by soffit panel manufacturer.

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B. Examine roughing-in for components and systems penetrating soffit panels to verify actual locations of penetrations relative to seam locations of soffit 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 C754 and soffit panel manufacturer's written recommendations.

3.3 INSTALLATION OF METAL SOFFIT PANELS

A. Install soffit panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor soffit panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving soffit panels.
2. Flash and seal soffit 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 soffit 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 soffit 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. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by soffit panel manufacturer.

D. Watertight Installation: Use means and methods recommended by manufacturer to result in installation that meets or exceeds specified performance requirements.

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 soffit panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by soffit panel manufacturer; or, if not indicated, provide types recommended by soffit panel manufacturer.

F. 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.

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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 achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as soffit panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of soffit panel installation, clean finished surfaces as recommended by soffit panel manufacturer. Maintain in a clean condition during construction.

B. After soffit panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace soffit panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074293

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SECTION 075416 - KETONE ETHYLENE ESTER (KEE) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Fully Adhered Ketone ethylene ester (KEE) roofing system.
2. Accessory roofing materials.
3. Sheathing/Substrate board.
4. Vapor retarder.
5. Roof insulation.
6. Insulation accessories and cover board.
7. Electronic leak detection (ELD) materials.
8. Walkways.

C. Section includes the installation of sound absorbing insulation strips in ribs of deck. Sound absorbing insulation strips are furnished under Section 053100 "Steel Decking."

D. Related Requirements:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section "Flashing and Trim" for metal roof flashings and counterflashings.
3. Division 07 Section "Roof Specialties and Accessories" for premanufactured copings and roof edge flashings.
4. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
5. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.
6. Division 26 "Lightning Protection System" for lightning protection items to be installed on rooftop.

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

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1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code**.**

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.4 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.

1. Meet with Owner, Architect, Building Envelope Commissioning Agent, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier 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. Review deck substrate requirements for conditions and finishes, 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 affects 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.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include data substantiating that materials comply with requirements.

1. Ketone ethylene ester (KEE) roofing system.
2. Accessory roofing materials.
3. Substrate board.
4. Vapor retarder.
5. Roof insulation.
6. Insulation accessories and cover board.
7. Electronic leak detection (ELD) materials.
8. Walkways.
9. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.

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2. Base flashings and membrane terminations.
3. Transitions and interface to other roof systems
4. Flashing details at penetrations.
5. Tapered insulation, including slopes.
6. Roof plan showing orientation of steel roof deck and orientation of roof membrane, layout of roof membrane rolls and seaming, methods of securement, spacings, and patterns for mechanically fastened roofing system.
7. Insulation fastening patterns for corner, perimeter, and field-of-roof locations necessary to satisfy windstorm classification rating specified.
8. Penetration details including methods of attachment, additional membrane securement bars and shapes, splices, sizes, spacing and types of anchors and fasteners
9. Locations of walkway pads.
10. Tie-in with air barrier.

C. Samples for Verification: For the following products:

1. Roof membrane and flashing, of color required.
2. Roof insulation.
3. Walkway pads or rolls, of color required.
4. Six insulation fasteners of each type, length, and finish.

D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, architects and owners and other information specified.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

   a. Submit evidence of compliance with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For roof membrane and insulation, tests performed by independent qualified testing agency indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing system, from ICC-ES.

E. Manufacturer's Review of Roofing: Before purchasing and delivering roofing materials to the project site, submit written statement signed by the Contractor and roofing subcontractor, stating that the drawings and specifications for roofing work have been reviewed with a qualified representative of the selected manufacturer of the roofing materials, and that the manufacturer has not indicated any further precautions or additional requirements to be fulfilled in connection with the use of the selected materials on this project.

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F. Inspection Letter: Submit letter of inspection from roofing manufacturer confirming that all substrates to receive single ply membrane roofing have been inspected and are capable of receiving a warrantable installation prior to beginning work.

G. Field Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

1. Concrete internal relative humidity test reports.
2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

H. Field quality-control reports.

I. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1. Field Seams: After installation is completed, submit 2 copies of inspection and testing report prepared by the single ply membrane manufacturer and countersigned by the applicator, outlining the testing and inspection procedures and attesting to the fact that the single ply membrane field seams including the expansion joints, were 100% inspected and tested.
2. Fastener Pull-Out Tests: After installation is completed, submit 2 copies of test report, outlining test procedures, test results and remedial actions taken, if required.
3. Leak Testing: After installation is completed, submit 2 copies of test report, outlining test procedures, test results and remedial actions taken, if required

B. Manufacturer's Acceptance Certification: Upon completion of the Work submit a written certified statement signed by the manufacturer stating that the field supervision by the manufacturer's representative was sufficient to insure proper application of the materials, that the Work was installed in accordance with the Contract Documents and that the installation is acceptable to the manufacturer and in compliance with specified warranty requirements.

C. Maintenance Data: For roofing system to include in maintenance manuals. Submit two (2) sets of manufacturer's printed instructions and recommendations for proper maintenance of the specified roof system including inspection frequencies, penetration addition policies, temporary repairs, and leak call procedures.

D. Warranty: Copy of executed warranty stating obligations, remedies, limitations, and exclusions of warranty.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed and listed in FM Approvals' RoofNav for roofing system identical to that used for this Project.

B. Installer Qualifications: An experienced installer with 5 year successful experience on projects of comparable size and scope to this Project, who is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

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C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E329.

D. Exterior Fire-Test Exposure: ASTM E108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

E. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

F. Reference Standards: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents.

1. Single Ply Roofing Institute (SPRI):
    a. Wind Load Design Guide For Low Sloped Flexible Membrane Roofing Systems
    b. Fastener Selection Guide
    c. ANSI/SPRI FX-1 Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
    d. ANSI/SPRI ES-1 Wind Design Guide For Edge Systems Used With Low Slope Roofing Systems
2. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.
3. Factory Mutual Group (FMG)
    a. FMG 4450: Approval Standard for Class 1 "Insulated Steel Deck Roofs".
    b. FMG 4470: Approval Standard Class 1 "Roof Covers".
    c. FMG "Approval Guide".
4. American Society of Civil Engineers (ASCE): ASCE-7 Minimum Design Loads for Buildings and Other Structures

1.9 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, approval or listing agency markings, 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.

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1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed in accordance with manufacturer's written instructions and warranty requirements.

B. Emergency Equipment: Maintain on-site equipment necessary to apply emergency temporary edge seal in the event of sudden storms or inclement weather.

C. Coordinate between various trades to avoid unnecessary rooftop traffic over sections of the roof and to prevent damage to the membrane. Heavily traveled areas shall be protected by placing temporary protection courses to prevent damage to the membrane.

1.11 WARRANTY

A. Special Warranty: Manufacturer's warranty, without monetary limitation, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, substrate board, and other components of roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, and walkway products, for the following warranty period:

1. Warranty Period: Five (5) years from Date of Substantial Completion.

C. Special Warranty for Polyisocyanurate Insulation: Upon completion of the work, provide polyisocyanurate insulation manufacturer's twenty (20) year warranty stating that the thermal resistance of the insulation shall not vary more than 20% from its published value. Upon notification of such defects, within the warranty period, make the necessary repairs or replacements, including cost of materials and labor, at the convenience of the Owner.

1.12 MAINTENANCE CONTRACT

A. Maintenance Contract: Provide rider to warranty, provide cost for a maintenance contract directly to the Owner, for them to purchase, agreeing to maintain roof and base flashing in a watertight condition for period of warranty, including:

1. Base ply materials, fasteners and adhesives.
2. Roof membrane components and adhesives.
3. Accessory products required for installation of membrane roofing system, including flashing plies and vapor retarder.
4. Roof insulation, substrate boards, cover boards, and fasteners.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

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A. Provide products recommended by manufacturers to be fully compatible with each other and with indicated substrates, or provide separation materials as required to eliminate contact between incompatible materials.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base flashings to withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and base flashings to remain watertight.

1. Accelerated Weathering: Roof membrane to withstand 2000 hours of exposure when tested in accordance with ASTM G152, ASTM G154, or ASTM G155.
2. Impact Resistance: Roof membrane to resist impact damage when tested in accordance with ASTM D3746 or ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Roofing materials to be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

1. Regulatory Requirements: Comply with applicable requirements of Florida Building Code including Florida Product Approval, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.

C. Design Wind Uplift Resistance: Design, fabricate and install roofing system identical to systems that have been successfully tested by qualified testing and inspection agency to resist the following inward and outward wind loads, live loads, building movement, wind uplift pressures, when tested in accordance with ASCE-7 and FM Approvals 4474, UL 580, or UL 1897:

1. Wind Loads: Wind pressures are based on the provisions of the American Society of Civil Engineers, "Minimum Design Loads for Buildings and Other Structures", ASCE 7-16 and the following design criteria:

    a. Ultimate Design Wind Speed ($\mathbf{V}_{ULT}$): 150 mph (3-Second Gust).
    b. Nominal Design Wind Speed ($\mathbf{V}_{ASD}$): 116 mph (3-Second Gust).
    c. Building Risk Category: Category IV.
    d. Wind Exposure Category: Exposure C.
    e. Internal Pressure Coefficient (GCPI): +0.18 / -0.18.

2. Wind pressures used in the Project design are shown on the Structural Drawings.
3. Surface mechanical fasteners are not permitted. Fasteners shall only be used for the primary lower layer of insulation. Other layers and membrane shall be fully adhered.

D. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and are listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.

1. Fire/Windstorm Classification: Class 1A-120.
2. Hail-Resistance Rating: FM Global Property Loss Prevention Data Sheet 1-34 SH.

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E. Solar Reflectance Index (SRI): Three-year-aged SRI not less than 64 or initial SRI not less than 82 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

F. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

G. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

H. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

I. Thermal Barrier: Design, fabricate and install insulated membrane roofing system with continuous insulation to provide a thermal envelope.

1. Provide additional insulation thickness to compensate for losses in insulation value due to supports, configuration, gaps and tolerances within roof assemblies.
2. No thermal bridging through the entire system will be tolerated. Accordingly, no fasteners will be allowed to break through the membrane. Roofing penetrations specified in Division 07 Section "Roofing Accessories and Specialties" shall be fully insulated and thermally isolated.

2.3 KETONE ETHYLENE ESTER (KEE) ROOFING SYSTEM

1. Basis of Design System: Seaman Corporation “Adhered Roofing System (FTR-AD).”

2.4 MEMBRANE

A. KEE Sheet: ASTM D6754/D6754M, fabric reinforced, or scrim reinforced, uniform flexible DuPont Elvaloy KEE HP resin modified sheet and fabric backed.

1. Ketone Ethylene Ester (KEE) Content: Not less than 50 percent by weight of the polymer content of the sheet when tested in accordance with ASTM D8154.
2. Thickness: 60 mil (1.5 mm), nominal.
3. Exposed Face Color: White.

B. Basis of Design Products: Subject to compliance with requirements, provide the following:

1. Seaman Corporation; "FiberTite-Xtreme 60-mil Membrane".
2. Equivalent products by other manufacturers will be considered subject to compliance with requirements.

C. Source Limitations: Obtain components for roofing system from manufacturer of roof membrane or manufacturer approved by roof membrane manufacturer.

D. Roofing System Assemblies: Provide the following roofing system assemblies complete with fasteners and accessories as indicated to comply with performance criteria:

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1. Concrete deck construction: Complete Single-ply roofing system consisting of single ply KEE membrane and flashing, fully adhered over cover board sheathing, semi-rigid tapered insulation, semi-rigid insulation, vapor retarder, over cast-in-place concrete.
2. Steel roof deck construction: Complete Single-ply roofing system consisting of single ply KEE membrane and flashing, fully adhered over cover board, semi-rigid tapered insulation, semi-rigid insulation, substrate board, over steel roof deck construction.

2.5 ACCESSORY ROOFING MATERIALS

A. General: Accessory materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesives and Sealants: Comply with VOC limits of authorities having jurisdiction.
2. Verify adhesives and sealants comply with the following limits for VOC content:

    a. Plastic Foam Adhesives: 50 g/L.
    b. Gypsum Board and Panel Adhesives: 50 g/L.
    c. Multipurpose Construction Adhesives: 70 g/L.
    d. Fiberglass Adhesives: 80 g/L.
    e. Contact Adhesives: 80 g/L.
    f. PVC Welding Compounds: 510 g/L.
    g. Other Adhesives: 250 g/L.
    h. Single-Ply Roof Membrane Sealants: 450 g/L.
    i. Nonmembrane Roof Sealants: 300 g/L.
    j. Sealant Primers for Nonporous Substrates: 250 g/L.
    k. Sealant Primers for Porous Substrates: 775 g/L.

B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as KEE sheet.

C. Fluid Applied Flashing: Manufacturer’s standard two component polyurethane based, reinforced, cold applied liquid flashing system compatible with roof membrane. Provide primers and accessories required for installation in accordance with manufacturers recommendations.

D. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

E. Roof Vents: As recommended by roof membrane manufacturer.

1. Size: Not less than 4-inch (100-mm) diameter.

F. Bonding Adhesive: Manufacturer's standard, water based.

G. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

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2.6 SUBSTRATE BOARD

A. Glass-Mat Gypsum Roof Substrate Board: ASTM C1177/C1177M, water-resistant gypsum board.

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

   a. Certainteed; SAINT-GOBAIN; GlasRoc Sheathing Type X.
   b. Georgia-Pacific Gypsum LLC.; Dens Deck Plus.
   c. USG Corporation; Securock Glass Mat Roof Board.

2. Thickness: Type X, 5/8 inch (16 mm).
3. Surface Finish: Factory primed.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.7 VAPOR RETARDER

A. Air and Vapor Barrier/Temporary Roof (for installation on concrete, plywood, substrate board): A 40 mils thick, minimum, composite consisting of 31.5 to 40 mil self-adhering (peel and stick) rubberized asphalt membrane laminated to a 5 mil UV-resistant polyfilm with an anti-skid surface which is compatible with FAST Adhesive, with maximum permeance rating of 0.13 perm. Provide one of the following complying with selected roofing system:

1. Basis of Design: "FiberTite Vapor Tite"; Seamans Corp.
2. Acceptable membranes: Torch-Applied & Hot Asphalt membranes are acceptable when in compliance with Florida Product Approval tested assembly.

B. Manufacturer's Lap Sealant: Manufacturer's standard lap sealant for overlapping and sealing air and vapor barriers/temporary roof.

2.8 ROOF INSULATION

A. Roof Insulation: Preformed roof insulation boards manufactured or approved by KEE roof membrane manufacturer, selected from manufacturer's standard sizes suitable for application of thicknesses indicated and that is, approved for use in FM Approvals' RoofNav listed roof assemblies.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2 or Type II, Class 2, Grade 2, felt or glass-fiber mat facer on both major surfaces, with a long term R value (LTTR) of 5 per inch.

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

   a. Carlisle Syntec Systems; Secure Shield Polyisocyanurate.
   b. GAF; EnergyGuard
   c. Hunter Panels; H-Sheild HD.
   d. Johns Manville; a Berkshire Hathaway company; Energy3.

2. Compressive Strength: 25 psi (172 kPa).
3. Size: 48 by 48 inches (1219 by 1219 mm).
4. Thickness: Minimum 5-1/2 inches, except as otherwise indicated.

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a. Base Layer: 2 inches.
b. Upper Layer: 3-1/2 inches.

C. Tapered Insulation: Provide factory-tapered insulation boards.

1. Material: Match roof insulation.
2. Minimum Thickness: 1/4 inch (6.35 mm).
3. Slope:

a. Roof Field: 1/4 inch per foot (1:48), unless otherwise indicated on Drawings.
b. Saddles and Crickets: 1/2 inch per foot (1:24), unless otherwise indicated on Drawings.

2.9 INSULATION ACCESSORIES AND COVER BOARD

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

1. Full-spread, spray-applied, low-rise, two-component urethane adhesive.
2. Verify adhesives and sealants comply with the following limits for VOC content:

a. Plastic Foam Adhesives: 50 g/L.
b. Gypsum Board and Panel Adhesives: 50 g/L.
c. Multipurpose Construction Adhesives: 70 g/L.
d. Fiberglass Adhesives: 80 g/L.
e. Contact Adhesives: 80 g/L.
f. PVC Welding Compounds: 510 g/L.
g. Other Adhesives: 250 g/L.
h. Single-Ply Roof Membrane Sealants: 450 g/L.
i. Nonmembrane Roof Sealants: 300 g/L.
j. Sealant Primers for Nonporous Substrates: 250 g/L.
k. Sealant Primers for Porous Substrates: 775 g/L.

D. Glass-Mat Gypsum Cover Board: ASTM C1177/C1177M, water-resistant gypsum board.

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

a. Georgia-Pacific Gypsum LLC.; Dens Deck Prime.
b. Gold Bond Building Products, LLC provided by National Gypsum Company; DEXcell Glass Mat Roof Board.
c. USG Corporation; Securock Glass-Fiber Roof Board.

2. Thickness: 5/8 inch (16 mm) as designed (1/2 inch minimum).
3. Surface Finish: Factory primed.

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2.10 ELECTRONIC LEAK DETECTION (ELD) MATERIALS (NOT USED)

2.11 WALKWAYS

A. Flexible Walkways: Seaman Corporation, “FTR-Tuff Track”; Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway rolls, approximately 3/16 inch (5 mm) thick and acceptable to roofing system manufacturer.

1. Color: Contrasting with roof membrane.

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 roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies 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 complies with requirements in Division 05 Section "Steel Decking."
4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
5. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer, when tested in accordance with ASTM F2170.
    a. Test Frequency: One test probe per each 1000 sq. ft. (93 sq. m), or portion thereof, of roof deck, with no fewer than three test probes.
    b. Submit test reports within 24 hours of performing tests.
6. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.

B. 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 system installation in accordance with roofing system manufacturer's written instructions. Remove sharp projections.

B. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday

1. 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.
2. If roof drains will be temporarily blocked or unserviceable due to partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under membrane roofing system components.

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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 INSTALLATION OF ROOFING, GENERAL

A. Install roofing system in accordance with roofing system manufacturer's written instructions, as required to direct water positively to roof drains and roof gutters, and FM Approvals' RoofNav listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under Division 07 Section "Membrane Air Barriers."

3.4 INSTALLATION OF SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches (610 mm) in adjacent rows.

1. At steel roof decks, install substrate board at right angle to flutes of deck.
    a. Locate end joints over crests of steel roof deck.
2. Tightly butt substrate boards together.
3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
4. Fasten substrate board to top flanges of steel deck in accordance with recommendations in FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29.
5. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof in accordance with roofing system manufacturers' written instructions.

3.5 INSTALLATION OF VAPOR RETARDER

A. Vapor Retarding Composite Film: Adhere film vapor retarder in a single layer over roof deck flutes in area to receive vapor retarder, side and end lapping each sheet a minimum of 4 inches and 6 inches, respectively.

1. Continuously seal side and end laps with manufacturer recommended tape.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.6 INSTALLATION OF INSULATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

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B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated, or if not indicated 1/4 inch in 10 ft. positive to drain.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 8 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. Installation Over Metal Decking:

1. Install base layer of insulation with end joints staggered not less than 12 inches (305 mm) in adjacent rows and with long joints continuous at right angle to flutes of decking.
    a. Locate end joints over crests of decking.
    b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    c. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
    d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).
        1) Trim insulation so that water flow is unrestricted.
    e. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
    f. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
    g. Mechanically attach base layer of insulation and substrate board using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
        1) Fasten insulation in accordance with requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
        2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation.
    a. Staggered end joints within each layer not less than 24 inches (610 mm) in adjacent rows.
    b. Install with long joints continuous and with end joints staggered not less than 12 inches (305 mm) in adjacent rows.
    c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    d. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
    e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).
        1) Trim insulation so that water flow is unrestricted.
    f. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
    g. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

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h. Adhere each layer of insulation to substrate using adhesive in accordance with FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

1) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

G. Installation Over Concrete Decks:

1. Install base layer of insulation with end joints staggered not less than 12 inches (305 mm) in adjacent rows.

a. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
b. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).

1) Trim insulation so that water flow is unrestricted.

c. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
d. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
e. Loosely lay base layer of insulation units over substrate.
f. Adhere base layer of insulation to vapor retarder in accordance with FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

1) Set insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation.

a. Staggered end joints within each layer not less than 24 inches (610 mm) in adjacent rows.
b. Install with long joints continuous and with end joints staggered not less than 12 inches (305 mm) in adjacent rows.
c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
d. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).

1) Trim insulation so that water flow is unrestricted.

f. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
g. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
h. Adhere each layer of insulation to substrate using adhesive in accordance with FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

1) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

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3.7 INSTALLATION OF COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction.

1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. At internal roof drains, conform to slope of drain sump.
    a. Trim cover board so that water flow is unrestricted.
3. Cut and fit cover board tight to nailers, projections, and penetrations.
4. Adhere cover board to substrate using adhesive in accordance with FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
    a. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.8 INSTALLATION OF ELD COMPONENTS (NOT USED)

3.9 INSTALLATION OF ADHERED ROOF MEMBRANE

A. Adhere roof membrane over area to receive roofing in accordance with roofing system manufacturer's written instructions. Unroll roof membrane and allow to relax before installing.

B. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Owner's testing and inspection agency.

C. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Fabric-Backed Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install fabric-backed roof membrane.

E. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.

F. Apply roof membrane in longest lengths possible, with side laps shingled with slope of roof deck where possible. Adhere membrane to coverboard in a continuous bed of adhesive. Install membrane free from bubbles, wrinkles, folds or other surface defects.

G. Lap seams in the direction of drainage. Apply membrane roofing with side laps shingled with slope of roof deck where possible. Provide smooth flat seams free from bubbles, wrinkles, folds or other surface defects. Apply a continuous bead of edge lap sealant to seams and joints which have had the factory edge cut or abraded.

H. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roof membrane and sheet flashings 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 roof membrane and sheet flashings.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.

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3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

J. Install membrane roofing and auxiliary materials to tie in to roofing installed on previous days, to maintain weathertightness of transition and to not void warranty for existing membrane roofing system.

K. Metal Work: At terminations and penetrations, set metal flanges in adhesive mastic. Strip metal flanges with flashing membrane set-in adhesive. Seal selvages, seams and joints. Where membrane or flashings terminate against parapet walls, curbs, pipe and vent penetrations and other such obstructions, provide termination bars and pipe clamping rings. Provide continuous sealant bead at top of termination bars and clamping rings.

L. Install membrane at terminations, penetrations, preformed curbs, dunnage, parapets and other interruptions of the roofing membrane. Provide mechanical fasteners, flashings counterflashings and accessories at recommended locations. Provide temporary seals and night seals to protect the insulation and the building interior.

M. Roofing Metal Work (Other than Roof System Metalwork): Be responsible for the proper attachment of specified work to roofing metal or related work that is embedded in, or in contact with, and becomes an integral part of specified roofing or flashing system, even when such roofing metal or related work is provided under other Sections of the Specifications.

N. Expansion Joints: Install expansion joints to ensure a complete watertight installation. Expansion joints shall be considered part of roofing system and shall be warranted as specified herein.

O. Coordinate with Article "Field Quality Control" for application of EFVM mesh/wire loop at perimeter of each area to be roofed in compliance with manufacturer's recommendations for field quality control testing.

3.10 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates in accordance with 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 to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

1. Take measures to ensure flashing does not ridge where there is change of direction

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

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3.11 INSTALLATION OF WALKWAYS

A. Flexible Walkways: Install walkway products in accordance with manufacturer's written instructions.

1. Install flexible walkways at the following locations:
    a. Perimeter of each rooftop unit.
    b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
    c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
    d. Top and bottom of each roof access ladder.
    e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
    f. Locations indicated on Drawings.
    g. As required by roof membrane manufacturer's warranty requirements.
2. Provide 6-inch (76-mm) clearance between adjoining pads.
3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive in accordance with roofing system manufacturer's written instructions.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.

B. Manufacturer's Technical Representative: At the start of the installation and periodically as work progresses provide the services of the manufacturer's technical representative at the job site as often as deemed necessary by the manufacturer to advise on phases of this work.

C. Perform the following tests:

1. Field Seams: Provide inspection and testing of the field seams to assure manufacturer's quality requirements are maintaining throughout the installation period. Each field seam including expansion joints, shall be 100% inspected and a written report prepared by the single ply membrane manufacturer shall be submitted for review prior to final acceptance.
    a. Provide a seam pull test at the start of each morning. Verify each gun/auto machine to verify temperature. Blunt test seams to verify bond.
2. Fasteners: Provide one fastener pull out test for every 2,500 ft.^{2} of roofing for the first 50,000 ft.^{2} of roofing, and one for each 5,000 ft.^{2} above the first 50,000 ft.^{2} verifying the integrity of the fasteners and compliance with the specified performance criteria.
3. Infrared Thermography: Testing agency surveys entire roof area using infrared color thermography in accordance with ASTM C1153.
    a. Perform tests before overlying construction is placed.
    b. After infrared scan, locate specific areas of leaks by electrical capacitance/impedance testing or nuclear hydrogen detection tests.
    c. After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
        1) Cost of retesting is Contractor's responsibility.
    d. Testing agency to prepare survey report of initial scan indicating locations of entrapped moisture, if any.

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4. Low-Voltage ELD Testing: Testing agency surveys entire roof area and flashings to locate discontinuities in the roof membrane using low-voltage horizontal membrane scanning platform, membrane electric field vector mapping, or vertical membrane scanning in accordance with ASTM D8231.

    a. Perform tests before overlying construction is placed.
    b. After testing, repair areas of discontinuities, repeat tests, and make further repairs until roofing and flashing installations are contiguous.

        1) Cost of retesting is Contractor's responsibility.

    c. Testing agency to prepare survey report indicating locations of initial discontinuities, if any.

D. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

E. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.13 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing system 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 roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and in accordance with warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.14 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <**Insert name of Owner**>.
2. Owner Address: <**Insert address**>.
3. Building Name/Type: <**Insert information**>.
4. Building Address: <**Insert address**>.
5. Area of Work: <Insert information>.
6. Acceptance Date: _____.
7. Warranty Period: <**Insert time**>.
8. Expiration Date: _____.

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B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
    a. lightning;
    b. peak gust wind speed exceeding <**Insert mph (m/s)**>;
    c. fire;
    d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. vapor condensation on bottom of roofing; and
    g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work in accordance with requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

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E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 075416

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SECTION 075552.16 - STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS PROTECTED MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Styrene-butadiene-styrene (SBS)-modified bituminous protected membrane roofing/waterproofing, including, but not limited to, the following:

    a. Base sheet materials.
    b. Ply sheets.
    c. Base flashing materials.
    d. Asphalt materials.
    e. Accessory roofing materials.

C. Related Requirements:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section “Terrace paving and Roof Garden Systems” for overburden systems.
3. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
4. Division 07 Section "Roof Specialties" for roof edge specialties.
5. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
6. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

1. Florida Building Codes and Standards Florida Building Commission

    a. Address: Florida Department of Community Affairs 2555 Shumard Oak Boulevard Tallahassee, Florida 32399-2100.
    b. Website: www.floridabuilding.org.
    c. Telephone: (850) 487-1824.

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code.

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1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.4 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier 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. Review deck substrate requirements for conditions and finishes.
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 affects 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.

B. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier 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.
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 affects 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.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Styrene-butadiene-styrene (SBS)-modified bituminous protected membrane roofing.
2. Base sheet materials.
3. Ply sheets.
4. Base flashing materials.

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5. Asphalt materials.
6. Accessory roofing materials.
7. Roof insulation.
8. Insulation accessories.

B. Shop Drawings: Include plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane terminations.
3. Flashing details at penetrations.
4. Tie-in with adjoining air barrier.

C. Samples for Verification: For the following products:

1. Roof paver, full sized, in each color and texture required.

D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

a. Submit evidence of compliance with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field Test Reports:

1. Concrete internal relative humidity test reports.

F. Field quality-control reports.

G. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

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1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: 20 years of experience manufacturing systems specified in this Section and capability to provide representation at the job site throughout the duration of installation and field inspection.

1. Field services of trained technical service representatives employed by the manufacturer issuing site visit reports in a timely manner.

B. Installer Qualifications: A qualified firm that is approved, authorized, certified, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1. Completion of projects of similar scope using same or similar materials specified.
2. Provision of full time, on-site superintendent or foreman experienced with the specified roofing from beginning through project completion.
3. Provision of system applicators skilled in application methods for system materials.
4. Maintenance of a daily record, on-site, documenting material installation and related project conditions.
5. Maintenance of a copy of submittal documents, on-site, available for reference.

1.9 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, approval or listing agency markings, 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 manufacturer.

1. Protect stored liquid material from direct sunlight.
2. 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.

1. Store in a dry location.
2. 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.

1.10 FIELD 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.

B. Monitor substrate temperature and material temperature, as well as environmental conditions such as ambient temperature, moisture, sun, cloud cover, wind, humidity, and shade. Ensure conditions are satisfactory to begin work and ensure conditions remain satisfactory during the installation of specified materials. Adjust materials and methods as necessary to accommodate

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varying project conditions. Do not install materials when conditions are unacceptable to achieve specified results.

C. Precipitation and Dew Point: Monitor weather to ensure project environment is dry before, and will remain dry, during the application of roofing materials. Ensure roofing materials and substrates remain above the dew point temperature to prevent condensation and maintain dry conditions.

D. Heat-Welding Application: Take necessary precautions and measures to monitor conditions to ensure environmental conditions are safe to use roof torches and hot-air welding equipment. Eliminate combustibles, flammable liquids, and solvent vapors that represent a hazard. Flammable primers and cleaners shall be fully dry before proceeding with heat-welding operations. Prevent or protect wood, paper, plastics, and other such combustible materials from direct exposure to open flames from roof torches. Refer to NRCA CERTA recommendations.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty to include all components of roofing system, such as roof insulation, fasteners, adhesives, cover board, roofing membranes, base flashings, and other components of roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

B. Roofing System Installer's Warranty: Submit Roofing System Installer's warranty, on warranty form at end of this Section, signed by Roofing System Installer, covering the Work of this Section, including all components of roofing system, such as roof insulation, fasteners, adhesives, cover board, roofing membranes, base flashings, and other components of roofing system.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and flashings to withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing system and flashings to remain watertight.

1. Accelerated Weathering: Roofing membrane to withstand 2000 hours of exposure when tested in accordance with ASTM G152, ASTM G154, or ASTM G155.

B. Material Compatibility: Roofing system materials to be compatible with one another and adjacent materials under conditions of service and installation required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. Wind-Uplift Resistance: Design roofing system to resist the following wind-uplift pressures when tested in accordance with UL 580, or UL 1897:

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1. Wind Loads: Wind pressures are based on the provisions of the American Society of Civil Engineers, "Minimum Design Loads for Buildings and Other Structures", ASCE 7-16 design criteria indicated on Drawings:
2. Surface mechanical fasteners are not permitted. Use fasteners only for the primary lower layer of insulation. Fully adhere other layers and membrane.

2.2 STYRENE-BUTADIENE-STYRENE (SBS)-MODIFIED BITUMINOUS PROTECTED MEMBRANE ROOFING

A. Styrene-Butadiene-Styrene (SBS)-Modified Bituminous Protected Membrane Roof System: See the following articles for individual roof materials required.

B. Manufacturer: Specification is based on materials and products of SOPREMA.

2.3 SOURCE LIMITATIONS

A. Obtain components, including roof insulation and accessory products for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.4 BASE SHEET MATERIALS

A. SBS-Modified Bitumen Type I, Polyester-Mat Base Sheet, Torch: ASTM D6164/D6164M, Type I, Grade S, SBS-modified asphalt sheet, reinforced with polyester fabric; smooth surfaced; suitable for torch application method.

1. Sheet Properties:
    a. Reinforcement: Non-woven polyester.
    b. Elastomeric Bitumen: Proprietary blend of bitumen and SBS polymers.
    c. Top Surfacing: Polyolefin film.
    d. Back Surfacing: Polyolefin film.
    e. Selvage Surface: Polyolefin film.
    f. Selvage Width: 3 inches(76 mm).
    g. End Lap: 6 inches (152 mm).
2. Physical Properties:
    a. Elongation at Peak Load, at 73.4 degrees F (23 degrees C), MD/XMD: ASTM D5147; 55/60 percent.
    b. Ultimate Elongation, at 73.4 degrees F (23 degrees C), MD/XMD: ASTM D5147; 65/80 percent
    c. Tear Strength, at 73.4 degrees F (23 degrees C), MD/XMD: ASTM D5147; 125 lbf (556 N)/85 lbf (378 N).
3. Product: Provide the following:
    a. “COLPHENE Flam 180.”

2.5 PLY SHEET MATERIALS

A. SBS-Modified Bitumen Type I, Torch: ASTM D6163/D6163M, Type I, Grade S SBS-modified sheet, glass-fiber reinforced, sanded top surface; suitable for torch application method.

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1. Sheet Properties:

    a. Reinforcement: Random glass fiber mat.
    b. Elastomeric Bitumen: Proprietary blend of bitumen and SBS polymers.
    c. Top Surfacing: Sanded.
    d. Back Surfacing: Polyolefin film.
    e. Selvage Surface: Polyolefin film.
    f. Selvage Width: 3 inches(76 mm).

2. Physical Properties:

    a. Elongation at Peak Load, at 73.4 degrees F (23 degrees C), MD/XMD: ASTM D5147; 5/4 percent.
    b. Ultimate Elongation, at 73.4 degrees F (23 degrees C), MD/XMD: ASTM D5147; 45/45 percent
    c. Tear Strength, at 73.4 degrees F (23 degrees C), MD/XMD: ASTM D5147; 60 lbf (267 N)/60 lbf (267 N).

3. Product: Provide the following:

    a. “COLPHENE SP 3.0.”

2.6 BASE FLASHING MATERIALS

A. Liquid Flashing System: Roof membrane manufacturer's standard one-part moisture curing resin with low solvent content.

1. General Properties:

    a. STPE moisture-cure technology.
    b. 100 percent solids.

2. Physical Properties:

    a. Shore A Hardness: ASTM D224: 30.
    b. Elongation at Break: ASTM D412 350 percent.
    c. Shear Strength: ASTM D1002 140 psi.
    d. Tensile Strength: ASTM D412 125 psi.

3. Product: Provide the following:

    a. “COLPHENE BARR FLASHING.”

2.7 ASPHALT MATERIALS

A. SEBS-Modified Roofing Asphalt: ASTM D6152/D6152M.

2.8 ACCESSORY ROOFING MATERIALS

A. General: Accessory materials recommended by roofing manufacturer for intended use and compatible with other roofing components.

1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.

B. Primer: ASTM D41, asphaltic primer.

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1. The maximum allowable VOC content for field-applied bituminous roof primer inside the weatherproofing barrier is 350 grams/Liter.

C. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

D. Cold-Applied Polymer-Modified Asphalt Adhesive: Roof membrane manufacturer's standard solvent-and asbestos-free, cold-applied adhesive, specially formulated for compatibility and use with roofing components.

E. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required by roofing system manufacturer for application.

F. Metal Flashing Sheet: As specified in Division 07 Section "Sheet Metal Flashing and Trim."

G. Miscellaneous Accessories: Provide accessories recommended by roofing system manufacturer.

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 roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations.
3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
4. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer, when tested according to ASTM F2170.
    a. Test Frequency: One test probe per each 1000 sq. ft. (93 sq. m), or portion thereof, of roof deck, with not less than three test probes.
    b. Submit test reports within 24 hours of performing tests.
5. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.

B. 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.

1. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.

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1. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Prime surface of concrete deck with asphalt primer at a rate of 3/4 gal./100 sq. ft. (0.3 L/sq. m) and allow primer to dry.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing," SPRI's Directory of Roof Assemblies listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. 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.

1. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Start installation of roofing in presence of manufacturer's technical personnel and Owner's testing and inspection agency.

D. Coordinate installation of roofing system, so components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing sheets with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
2. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

E. Asphalt Heating:

1. Heat asphalt to its equiviscous temperature, measured at the mop cart or mechanical spreader immediately before application.

    a. For cap sheets, heat asphalt according to cap sheet manufacturer's recommendations.

2. Circulate asphalt during heating.
3. Do not raise roofing asphalt temperature above equiviscous temperature range more than one hour before time of application.
4. Do not exceed roofing asphalt manufacturer's recommended temperature limits during roofing asphalt heating.
5. Do not heat roofing asphalt within 25 deg F (14 deg C) of flash point.
6. Discard roofing asphalt maintained at a temperature exceeding finished blowing temperature for more than four hours.
7. Apply hot roofing asphalt within plus or minus 25 deg F (14 deg C) of equiviscous temperature.

F. SEBS-Modified Asphalt Heating: Heat and apply roofing asphalt according to roofing system manufacturer's written instructions.

G. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

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3.4 INSTALLATION OF BASE-SHEET

A. Before installing, unroll base sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature.

B. Installation of SBS-Modified Bitumen Base Sheet:

1. Install base sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.
2. Extend roofing sheets over and terminate above cants.
3. Install base sheet in a shingle fashion.
4. Adhere to substrate in a uniform coating of cold-applied adhesive.
5. Torch-apply to substrate.
    a. Perform torch application according to NFPA 241, including two-hour fire watch after torches have been extinguished.
6. Install base sheet without wrinkles, tears, or air pockets.
7. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.
    a. Lap side laps as recommended by roof membrane manufacturer but not less than 3 inches (76 mm).
    b. Lap end laps as recommended by roof membrane manufacturer but not less than 12 inches (300 mm).
    c. Stagger end laps not less than 18 inches (457 mm).
    d. Heat-weld end laps, leaving no voids.
    e. Roll laps with a 20-pound (9-kg) roller.
8. Repair tears and voids in laps and lapped seams not completely sealed.
9. Apply pressure to the body of the base sheet according to manufacturer's instructions, to remove air pockets and to result in complete adhesion of base sheet to substrate.

3.5 INSTALLATION OF PLY SHEETS

A. Install ply sheets, starting at low point of roofing.

1. Align ply sheets without stretching.
2. Shingle side laps of ply sheets uniformly to achieve required number of plies throughout thickness of roofing membrane.
    a. Shingle in direction to shed water.
3. Extend ply sheets over and terminate above cants.
4. Embed each ply sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing manufacturer, to form a uniform membrane without ply sheets touching.

3.6 INSTALLATION OF FLASHING AND STRIPPING

A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions:

B. Install liquid flashing system according to manufacturer's recommendations.

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1. Extend liquid flashing not less than 3 inches (76 mm) in all directions from edges of item being flashed.
2. Embed granules, matching color of roof membrane, into wet compound.

C. Install roofing cap sheet stripping where metal flanges and edgings are set on roofing according to roofing system manufacturer's written instructions.

D. Roof Drains: Install flashing according manufacturer's instructions and as required by regulatory approvals.

3.7 INSTALLATION OF INSULATION

A. Loosely lay separator sheet over cooled roofing membrane, with minimum 2-inch (51-mm) side laps and 4-inch (100-mm) end laps.

B. Loosely lay insulation over roof membrane, with long joints of insulation in continuous straight lines and with end joints staggered not less than 12 inches (300 mm) between rows.

1. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
2. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
3. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

C. Install protection layer cover board over insulation, overlapping edges and ends at least 12 inches (300 mm).

1. Do not cover drains or restrict water flow to drains.

3.8 INSTALLATION OF COVER BOARD

A. Comply with roofing system and insulation manufacturer's written installation instructions.

B. Install cover board over insulation with long joints in continuous straight lines, with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction.

1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. At internal roof drains, conform to slope of drain sump.
3. Trim cover board, so that water flow is unrestricted.
4. Cut and fit cover board tight to nailers, projections, and penetrations.
5. Secure cover board to resist specified uplift pressure at corners, perimeter, and field of roof.

3.9 INSTALLATION OF ROOF PAVERS

A. Install roof pavers over roofed area according to insulation manufacturer's written instructions.

1. Mechanically fasten securement strapping to center of first two perimeter rows and first two perimeter corner rows of roof pavers in each direction from corner, closest to edge of roof, using straps running parallel to parapet wall or roof edge.

B. Install roof pavers on pedestals set according to pedestal manufacturer's written instructions.

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C. Lay out pattern of precast units so that units terminate on an even line no more than 2 in. from the vertical surface or penetration, cutting units as necessary.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, roofing membrane installation, flashings, protection, and drainage components, and to furnish reports to Architect.

B. Perform the following tests:

1. Flood Testing: Flood test each roofing area for leaks, according to recommendations in ASTM D5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

   a. Perform tests before overlying construction is placed.
   b. Flood to an average depth of 2-1/2 inches (65 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (51 mm) of clearance from top of base flashing.
   c. Flood each area for 24 hours.
   d. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.

      1) Cost of retesting is the responsibility of the Contractor.

   e. Testing agency to prepare survey report indicating locations of initial leaks, if any, and final survey report.

C. Test Cuts: Test specimens will be removed to evaluate problems observed during quality-assurance inspections of roofing membrane as follows:

1. Determine approximate quantities of components within roofing membrane according to ASTM D3617/D3617M.
2. Examine test specimens for interply voids according to ASTM D3617/D3617M and to comply with criteria established in Appendix 3 in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
3. Repair areas where test cuts were made according to roofing system manufacturer's written instructions.

D. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

E. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

F. Roofing system will be considered defective if it does not pass tests and inspections.

G. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

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3.11 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period.

1. When remaining construction does not affect or endanger roofing, inspect roofing system 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 roofing system that does not comply with requirements, repair substrates, and repair or reinstall 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.

3.12 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing System Installer," has performed roofing and associated Work on the following Project:

1. Owner: _____.
2. Owner Address: _____.
3. Building Name/Type: _____.
4. Building Address: _____.
5. Area of Work: _____.
6. Warranty Period: Five years from date of Substantial Completion.
7. Date of Substantial Completion: _____.

B. AND WHEREAS Roofing System Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said Work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing System Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing System Installer will, at Roofing System Installer's own cost and expense, make or cause to be made such repairs to or replacements of said Work as are necessary to correct faulty and defective Work and as are necessary to maintain said Work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

a. lightning;
b. peak gust wind speed exceeding 120 **mph (53.6 m/s)**.
c. fire;
d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the Work;
f. vapor condensation on bottom of roofing; and

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g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When Work has been damaged by any of foregoing causes, Warranty will be null and void until such damage has been repaired by Roofing System Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing System Installer is responsible for damage to Work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of Work.
4. During Warranty Period, if Owner allows alteration of Work by anyone other than Roofing System Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty will become null and void on date of said alterations, but only to the extent said alterations affect Work covered by this Warranty. If Owner engages Roofing System Installer to perform said alterations, Warranty will not become null and void unless Roofing System Installer, before starting said Work, will have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate Work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty will become null and void on date of said change, but only to the extent said change affects Work covered by this Warranty.
6. Owner will promptly notify Roofing System Installer of observed, known, or suspected leaks, defects, or deterioration and afford reasonable opportunity for Roofing System Installer to inspect Work to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing System Installer on said Work and will not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty will not operate to relieve Roofing System Installer of responsibility for performance of original Work in accordance with requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 075552.16

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SECTION 075555 - TERRACE PAVING AND ROOF GARDEN SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Terrace paving system, including roof pavers.
2. Vegetated roof garden system, including engineered soils and sedum.
3. Insulation materials.
4. Drainage materials.

C. Related Requirements:

1. Division 06 Section "Rough Carpentry" for wood blocking and curbs.
2. Division 07 Section “Styrene-Butadiene-Styrene (SBS) Modified Bituminous Protected Membrane Roofing” for roofing/waterproofing directly on roof deck.
3. Division 07 Section "Flashing" for flashing, counterflashing, and metal roof penetration flashing, not specified in this section.
4. Division 07 Section "Roofing Specialties and Accessories".
5. Division 07 Section "Joint Sealants" for joint sealants and fillers.
6. Division 22 Section "Storm Drainage Piping Specialties" for roof deck drains.
7. Division 32 Sections "Plants", "Turf and Grasses", Soil Preparation", Irrigation Systems" for plantings over fluid applied protected membrane and garden roofing specified in this section.

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code.

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1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079, glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" and Roof Consultants Institute “Glossary of Terms” for definition of terms related to roofing work in this Section.

1.4 PRE-INSTALLATION MEETING

A. Pre-installation Conference: Conduct conference at Project site to comply with Division 01 Section "Project Management and Coordination.”

B. Attendees: Require attendance by the Owner's Representative, the Testing and Inspection Agency, the Commissioning Agent, the Contractor, Subcontractor, the Architect, Roofing Installer, the Landscape Architect, Manufacturer's Field Representative and other parties directly affecting the work.

C. Agenda: Review methods and procedures related to roofing system including, but not limited to, the following:

1. Methods and procedures related to roofing installation, including manufacturer's written instructions.
2. Construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Substrate conditions and finishes for compliance with requirements, including flatness.
4. Structural load limitations of roof deck during and after roofing.
5. Flashing, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
6. Regulations and requirements of authorities having jurisdiction for insurance, certifications, and inspection and testing if applicable.
7. Temporary protection requirements for roofing system during and after installation.
8. Roof observation and repair procedures after roofing installation.
9. Review soil type and planting types determined for use on the project.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of roofing.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, project specific details, and attachments to other work and the following

1. Show locations and extent of roofing.
2. Base flashings and membrane terminations.
3. Membrane terminations
4. Roof penetrations.
5. Vertical intersections.
6. Substrate slopes.
7. Substrate detailing of joints and cracks.
8. Expansion joints.
9. Show locations, extent, and details of roof pavers.
10. Show locations, extent and details of planted areas.

C. Samples for Verification: Submit 12 in. sq. samples for each of the following products:

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1. Insulation materials.
2. Protection sheet.
3. Drainage materials.
4. Roof paver, full sized, in each color and texture, and finish required.
5. Paver pedestal assembly, one of each type.
6. Metal termination bars, 12 in. long.
7. Water Pervious Fabric.
8. Root Barrier.
9. Extensive engineered soil
10. Extensive vegetation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer, and testing agency

1. Provide documentation on manufacturer's letterhead stating approval of installer.

B. Fabrication Engineering and Design: Submit fabrication engineering calculations for pavers and overburden showing that roof top pavers and amenities comply with wind loads, uplift, building movement, floatation requirements per Tech note 508.3, complying with wind diagrams.

1. Calculations for wind speed at edges, corners and field of installation for uplift calculations and ASCE-7 and loads specified in "Performance Requirements" article

C. Installer/Manufacturer Certificates: Signed by roofing installer and manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" article and stating the following:

1. Substrate and conditions are acceptable for providing warranty.
2. Materials supplied meet specified requirements.
3. Documentation that system meets recommendations of Dow Technote #508.2

D. Field quality-control reports and manufacturer's final roof inspection report.

E. Warranties: Draft of special warranties specified in this Section.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Inspection Report for Information: Copy of roofing system manufacturer's inspection report of completed roofing membrane.

1.8 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing fully reinforced fluid applied liquid resin waterproofing and roofing systems with a minimum of ten (10) years documented application in the United States.

B. Soils and Planting Manufacturers: Companies specializing in soils and planting with 5 years successful experience on projects of comparable size and scope.

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C. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

D. Manufacturer's Technical Representative shall provide the following inspections of the roofing application:

1. Start of work inspection to review special detailing conditions and substrate preparation
2. Periodic in progress inspections to evaluate membrane and flashing application
3. Final punch-list inspection at completion of each phase of the project prior to installation of surfacing materials.
4. Warranty inspection to confirm completion of punch list items and surfacing.

E. Mockups: Install roofing/waterproofing membrane to 100 sq. ft. of deck to demonstrate surface preparation, joint and crack treatment, thickness of roofing membrane, and execution quality. Install insulation, and roof pavers over roofing membrane.

1. If Architect determines mockups do not comply with requirements, reapply roofing and overlaying construction until mockups are approved.
2. Mockups maintained in an undisturbed condition may be incorporated into the completed Work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original containers 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.

1. Handle and store roofing materials and place equipment in a manner to avoid significant or permanent damage to deck or structural supporting members.

B. Protect materials from damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location.

C. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Apply roofing within the range of ambient and substrate temperatures recommended by roofing system manufacturer. Do not apply roofing to a damp or wet substrate or when temperature is below 5 deg F.

1. Do not apply roofing in snow, rain, fog, or mist, or when such weather conditions are imminent during application and curing period.

B. Maintain adequate ventilation during application and curing of roofing materials.

C. Odor Control: Implement odor control and elimination measures prior to and during the application of the roofing materials in accordance with the manufacturer's written instructions. Field test during off hours by sealing air intakes with activated carbon filters. Install filters in accordance with requirements and recommendations of the filter manufacturer. Seal doors, windows, skylights and other openings to prevent leakage of air into the building or adjacent buildings.

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1.11 WARRANTY

A. Manufacturer's Warranty:, Manufacturer's total system warranty in which roofing manufacturer agrees to repair or remove and replace components of roofing system that fail in materials or workmanship to remain watertight within specified warranty period.

1. This warranty provides for cost of labor and materials for loss of watertightness, limited to amounts necessary to effect repairs necessitated by either defective material or defects in related installation workmanship, with no dollar limitation (“NDL”).
2. Warranty also includes Leak remediation, including repair, removal and replacement of membrane roofing, base flashings, insulation, roofing accessories, and roof pavers, garden roof components including soil and plantings as well as other components of membrane roofing system.
3. Pavers Warranty: Pavers must not dish or warp, nor crack, split, or disintegrate in freeze-thaw conditions.
4. Insulation Warranty: Insulation shall retain at least 80% of insulation value and remain in place, resisting float and wind uplift.
5. Make repairs within seventy-two (72) hours of the receipt of a notice from the Owner. Make repairs without reference to or consideration of the cause or nature of such leaks or defects.
1. Warranty Period: [Ten (**10)**] [Fifteen (**15)**] [Twenty (**20)**] [**Thirty (30)**] years from date of Substantial Completion.

B. Unless otherwise specified, warranty terrace paving and roof garden system against failure due to wind speeds up to and including wind loads specified on structural drawings. In addition, the warranty shall state the following:

1. The roof (including flashings integral therewith) will remain in a watertight condition during the warranty period.
2. The roof ballast will remain on the roof, and when precast concrete pavers are installed shall include the performance of the pavers,
3. The thermal resistance of the insulation will not vary more than 10% from its published value, for a warranty period of fifteen (15) years.

C. This Warranty and Maintenance Agreement, and the enforcement of its provisions, shall not deprive the Owner of any action, right or remedy otherwise available to them.

D. Roofing System Installer's Warranty: Submit roofing system installer's warranty covering Work of this Section, including roofing membrane, flashings, metalwork, insulation, and roofing accessories as well as components of plaza deck paver system and garden roofing for the following warranty period:

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. System Description: Provide terrace paving system, and roof garden system including but not limited to protection sheet, root barrier, water pervious fabric, drainage course, roofing aggregate, substrate membrane adhesive, mastics, thinners, sealers, release agents, primers and solvents; insulation materials, drainage materials, fasteners and other accessories recommended by roof membrane manufacturer for a complete system.

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1. Roof System for Non-Garden Areas: Complete with insulation materials, filter fabric, drainage materials, pavers, and other hard surfaces as shown.
2. System for Garden Areas: Complete with protection sheet, root barrier, insulation, drainage mat, moisture retention mat, drainage panels, filter fabric, soil substrate and intensive/extensive vegetation.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.

C. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

D. Performance Requirements: Installed fluid applied protected membrane and garden roofing system with compatible components shall withstand specified uplift pressures, building movement, flotation loads, thermally induced movement and exposure to weather without failure. Membrane roofing and base flashings shall remain watertight; and entire system shall not permit passage of liquid into the building.

1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D3746 or ASTM D4272.

E. Structural Loads: Design, fabricate, and install membrane roofing system identical to systems that have been successfully tested by a qualified testing and inspection agency to resist wind uplift pressures, snow loads and live loads according to ASCE-7.

F. FM Approvals Listing: Provide insulated membrane garden roof system, base flashings, and component materials that comply with requirements in the following reference standards:

1. FM Global Property Prevention Data Sheets 1-35, "Green Roof Systems".

G. Exterior Fire-Test Exposure: Provide hot fluid-applied protected membrane roofing system and insulated membrane garden roof system identical to assemblies tested for fire-test-response characteristics as determined by testing identical system in accordance with tests below by UL or FMG. Identify products with appropriate markings of applicable testing agency.

1. Exterior Fire-Test Exposure: Class A noncombustible decks; complying with ASTM E108 or UL 790, for application indicated; testing by a qualified testing agency.

H. Roofing pavers used in fluid applied protected membrane or garden roof systems shall have an initial Solar Reflectance Index (SRI) of 82 or greater or a 3 year averaged SRI of 64, in accordance with ASTM E1980.

I. Thermal Barrier: Design, fabricate and install fluid applied protected membrane roofing system with continuous insulation to provide a thermal barrier. Provide thickness of insulation required to achieve a minimum effective thermal [**R-value of 20; U value of 0.05**] [**R-value of 30; U value of 0.033**]. Provide additional insulation thickness to compensate for losses in insulation value due to supports, configuration, gaps and tolerances within roof assemblies.

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2.2 ROOFING SYSTEMS

A. General: Provide assemblies below with components, details, transitions and thicknesses detailed on drawings of the following types:

2.3 ROOFING MEMBRANE

A. Hot Fluid-Applied, Rubberized-Asphalt Roofing Membrane: Single component; 100 percent solids; hot fluid-applied, rubberized asphalt; complying with the following requirements:

1. Basis of Design for Fluid Applied Protected Membrane Roofing: PMR-FR, using Monolithic Membrane 6125FR" by Sika Corporation, American Hydrotech, Inc. has been selected as the basis of design for the project. Equivalent systems from one of the following manufacturers will be considered provided they comply with performance requirements of the Basis of Design:

    a. Barrett Company; Ram-Tough 250-DM.
    b. Carlisle Coatings & Waterproofing Inc.; CCW-500R.
    c. Henry Company; 790-11 (reinforced).

2. Basis of Design for Garden Roofing: "Monolithic Membrane 6125EV-Environmental Grade-FR Fabric Reinforced" by Sika Corporation, (American Hydrotech, Inc). has been selected as the basis of design and shall serve as the standard of quality required for the project. Equivalent systems from the following manufacturers will be considered provided they comply with performance requirements of the Basis of Design:

    a. Barrett Company.
    b. Henry Company.
    c. Carlisle Coatings & Waterproofing.

B. Subject to compliance with requirements, provide one of the following:

1. Physical Requirements in CGSB-37.50, "Hot Applied, Rubberized Asphalt for Roofing and Waterproofing," as demonstrated by testing performed by a qualified independent testing agency of manufacturer's current roofing formulations:

    a. Flash Point: Not less than 260 deg C or not less than 25 deg C above manufacturer's maximum recommended application temperature.
    b. Cone Penetration: 110 maximum at 25 deg C and 200 maximum at 50 deg C.
    c. Flow: 3 mm maximum at 60 deg C.
    d. Toughness: Not less than 5.5 J.
    e. Ratio of Toughness to Peak Load: Not less than 0.040.
    f. Adhesion Rating: Pass.
    g. Water-Vapor Permeance: 1.7 ng/Pa x s x sq. m.
    h. Water Absorption: 0.35-g maximum mass gain or 0.18-g maximum mass loss.
    i. Pinholing: Not more than one pinhole.
    j. Low-Temperature Flexibility: No cracking.
    k. Crack Bridging Capability: No cracking, splitting, or loss of adhesion.
    l. Heat Stability: Comply with requirements for penetration, flow, low-temperature flexibility, and viscosity when heated for five hours at manufacturer's recommended application temperature.
    m. Viscosity Test: 2 to 15 seconds.

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2.4 BASE FLASHING SHEET MATERIALS

A. Fluid Applied Flashing (**FL-04**) Cold liquid applied reinforced flashing membrane with integral colored finish used to seal roofing and waterproofing conditions including but not limited to drain, pipe, perimeter, penetration flashings and other roof penetrations as shown. Membrane consisting of two-component, with catalyst, cold fluid applied reinforced low-odor (PMMA) Polymethyl-Methacrylate flashing/vertical grade waterproofing with a 360 degree needle punched non-woven 100 g/sq. m polyester reinforcing fleece, for a finished dry film membrane thickness of 0.080 inch nominal per ply; conforming to ASTM C836

1. Products manufactured and supplied by the following:

    a. Parapro Flashing (Siplast)
    b. SeamFree PMMA Flashing Resin-Fibrated (JM)
    c. Alsan RS 260 LO Flash Resin (Soprema)
    d. R230 Thixo Flashing Membrane (ALT Global LLC)

2. Accessories: Proprietary resin primers, additives, surfacing topcoats, and accessory products as required or recommended by membrane manufacturer.

B. Elastomeric Flashing Sheet (**FL05**): 50-mil-thick, minimum, uncured sheet neoprene with manufacturer's recommended contact adhesives as follows:

1. Tensile Strength: 1400 psi minimum; ASTM D412, Die C.
2. Elongation: 300 percent minimum; ASTM D412.
3. Tear Resistance: 125 psi minimum; ASTM D624, Die C.
4. Brittleness: Does not break at minus 30 deg F; ASTM D2137.

C. Elastomeric Flashing Accessories

1. Bonding Adhesive: Manufacturer's one-component neoprene base contact adhesive specifically recommended for applying sheet flashing to vertical surfaces.
2. Splicing Cement: Manufacturer's synthetic rubber-base polymer adhesive specifically recommended for securing vertical laps in sheet flashing.
3. Lap Seal: Manufacturer's EPDM or synthetic rubber sealant specifically recommended for sealing lap joints in sheet flashing.
4. Water Block Mastic: Manufacturer's recommended mastic for bedding flashing anchors.
5. The maximum allowable VOC content for field-applied roof adhesive, cement, sealant and mastic inside the weatherproofing barrier is 300 grams/Liter.

2.5 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.

1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.

B. Primer: ASTM D41, asphaltic primer.

1. The maximum allowable VOC content for field-applied bituminous roof primer inside the weatherproofing barrier is 350 grams/Liter.

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C. Eggcrate for Water Storage: "Permavoid" (Sika Corporation, ABT/American Hydrotech); plastic structure created by plastic tubes between webbed top and bottom panels to provide a stable platform with open space of 95% within the unit. Units to be connected with manufacturer's standard plastic dovetail connectors

D. Water Pervious Geotextile Filter Fabric: Woven or nonwoven polypropylene, polyolefin, or polyester geotextile fabric; water permeable and resistant to UV-light degradation; of type and weight recommended by insulation manufacturer for application. Used for placement between the polystyrene insulation system and the stone ballast or pavers/plaza deck consisting of a black coated non-woven polyester fabric maintaining a minimum weight of three (3) ounces per square yard (3 oz/sq. yd.).

E. Drainage Mat: Three dimensional matrix with filter fabric on top side, 12,000 psf, 12 gpm flow, Hydrodrain 1000 or equal.

2.6 GARDEN ROOF COMPONENTS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core, and a polymeric film bonded to the other side; and with a vertical flow rate of 9 to 15 gpm per ft. Subject to compliance with requirements, provide one of the following:

1. Sika Corporation, American Hydrotech, Inc.; Hydrodrain 420.
2. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRAIN 6200.
3. Grace, W. R., & Co. - Conn.; Hydroduct 660.

B. Prefabricated Drainage Course for Roof Garden Areas: "Hydrodrain Max" (Sika Corporation, American Hydrotech); three dimensional, molded panels, 1.5 in. thickness, made of recycled HDPE with drainage channels with holes on top side and water retention reservoirs, crushproof drainage core for use in garden insulated membrane roofing (waterproofing) system.

C. Drainage Inspection Devices: Provide Hydrotech "GardenHatch Inspection Chamber", 18 gage stainless steel over drain inspection device over each drain within the soft landscape area. The drainage layer shall be close butted to the base of the inspection device. The filter sheet shall be dressed up all sides of the inspection device to soil level. Provision shall be made to install and form a barrier between the vegetation and all vulnerable roof details, i.e. at parapets, outlets, vent pipes etc. The barrier must be a minimum of 12 in. wide, and consist of large, rounded aggregate.

D. Moisture Retention Mat for Roof Garden Areas: "Rock Wool" (Sika Corporation, American Hydrotech); rot-proof fibrous mineral fiber mat strength class 3, used for water and nutrient retention as recommended by the system membrane manufacturer

E. Protection Sheet/Root Barrier: Manufacturer approved continuous 160 mil thick polyester reinforced SBS modified asphalt sheet, with granular surface and root inhibiting additive,

1. Basis of Design: "Hydroflex RB II" (Sika Corporation, American Hydrotech, Inc.); or equal approved by selected roofing manufacturer, in soil area.

F. Soil for Roof Garden Areas

1. Intensive Soil: Custom growing media mix with an application density of 44 lbs/ft3 – 68 lbs/ft3 and pH of 5.5 to 7.5 capable of supporting vigorous growth of the specified vegetation installed onto the filter sheet to a depth shown, complete with appropriate

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nutrients and organic material as recommended and supplied by roof garden system manufacturer.

2. Extensive Soil: Custom growing media mix with an application density of 38 lbs/ft3 – 69 lbs/ft3 and pH of 6.5 to 7.5 capable of supporting vigorous growth of the specified vegetation installed onto the filter sheet to a depth of 4 in. complete with appropriate nutrients and organic material as recommended and supplied by roof garden system manufacturer.

G. Miscellaneous Materials for Roof Garden System: Provide water retaining boards, moisture retention mats and other products and materials to provide a complete watertight garden roof system in accordance with manufacturer's requirements and requirements of scheduled plantings and landscaping.

1. Stainless Steel Closures: Provide ASTM A240 sheet and plate closures of profiles and dimensions shown, with No. 2 Dull finish at transitions between garden roof and blue roof systems and elsewhere as shown.

H. Woven-Geotextile-Faced, Sheet Drainage Panel (Horizontal Application): Manufactured composite subsurface drainage panels consisting of a woven-geotextile facing with an apparent opening size not exceeding No. 40 sieve, laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a horizontal flow rate not less than 2.8 gpm/ft.

2.7 DRAINAGE BOARDS

2.8 DRAINAGE AGGREGATE

A. Drainage Aggregate: 3/8 in. to 3/4 in. (1/4 in. to 1-1/4 in. in drain areas adjacent to soil) expanded lightweight aggregate for use as fill material within drainage course only areas scheduled as fluid applied protected membrane garden roofing system.

2.9 INSULATION

A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approved roof insulation.

B. Insulation Type (**INS-01B**): Rigid, closed-cell extruded expanded polystyrene with integral high density skin complying with ASTM C578, Type VII, minimum compressive strength of 60 psi; minimum R-Value of 5.0 per 1 in. thickness at 75 deg F. (24 deg C); standard sizes; thickness as shown; with channeled edges; one of the following:

1. "Styrofoam Brand PlazaMate" (The Dow Chemical Co.).
2. "Foamular NGX 604 RB (Ribbed)" (Owens-Corning Foam Insulation, LLC.).
3. "GreenGuard XPS Drainage Channel Insulation Board" (Kingspan Insulation).

C. Insulation Type (**INS-01C2)**: ASTM C578, Type VII, 2.2 lbs./cu. ft. density and 60 psi compressive strength; manufacturer's standard sizes; thickness as shown; one of the following:

1. "Styrofoam Brand Highload 60" (DuPont PBS).
2. "Formular NGX 600" (Owens Corning Foam Insulation, LLC).
3. "GreenGuard Type VII 60 PSI XPS Insulation Board" (Kingspan Insulation).

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D. Insulation Type (**INS01C3)**: ASTM C578, Type V, 100 psi compressive strength; manufacturer's standard sizes; thickness as shown; one of the following:

1. "High Load 100" (The Dow Chemical Co.).
2. "1000 XPS" (Owens-Corning Corp.).

E. Mortar-Faced, Extruded-Polystyrene Board Insulation (INS-01H): ASTM C578, Type VI, 1.8-lb/cu. ft. minimum density, 40 psi compressive strength, with tongue-and-groove edges on long dimension, and latex-modified cement mortar topping, 15/16 inch thick, 11 lb./sq. ft. Material to have aged R-value of R-5 per inch. Subject to compliance with requirements, provide the following:

1. T-Clear "HeavyGuard Concrete faced Insulated Perimeter Wall panels".
2. Sika Corporation, American Hydrotech, Hydroguard Heavyweight PMR.

2.10 INSULATION ACCESSORIES

A. Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.

C. Metal Securement System: Perimeter securement flashing and strapping fabricated from stainless steel, a minimum of 0.031 inch thick. Provide fasteners as recommended by mortar-faced insulation manufacturer.

2.11 ROOF PAVERS

A. Lock Down Roof Pavers (**PAV-02**): "Guardian Pavers" or approved equal, consisting of heavyweight, hydraulically pressed, concrete units, square edged, factory cast for use as roof pavers with special corners necessary for lock down type connections; and complying with the follow requirements:

1. Size: Panel size as shown on drawings, thickness required for panel size and weight required comply with performance criteria. Provide 24 by 24 x thickness required to counteract flotation and uplift, where size is not shown. Manufacture pavers to dimensional tolerances of plus or minus 1/16 inch in length, height, and thickness.. lb/sq. ft. within field and minimum 22 lbs/sq. ft. at perimeter, or heavier as necessary to comply with Dow Technote 508.1.
2. Absorption: Less than 5%. per ASTM C140.
3. Density: 155 lb./ ft.3.
4. Compressive Strength: 7500 psi, minimum; ASTM C140.
5. Freeze/Thaw Resistance: No breakage and maximum 1 percent mass loss per ASTM C1782.
6. Colors and Textures: <**insert color and texture**>.
7. Finish: Tudor finish
8. Emittance: 0.90 in accordance with ASTM 408
9. Solar Reflectance Index (SRI): Minimum 78, and a three-year, aged Solar Reflectance Index of not less than 64 when calculated in accordance with ASTM E1980, based on testing identical products by a qualified testing agency.
10. Manufacturer: "Architectural Products)

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B. Adjustable Leveling Lock Down Paver Pedestal Supports: Provide the following:

1. "Guardian Pedestals" (Wausau Tile, Inc.); 3-piece pedestal that combined with shaped paver will lock down entire roof pavers surface and prevent horizontal and vertical movement of the roof paver. Pedestals with square top that allows its bolt to pass through to a base beneath, fitting into a recessed grooved portion of the guardian paver. components fabricated from high density polyethylene consisting of 7-1/2 in. dia. adjustable pedestals, extenders, rubber spacers, and reducers. . Provide 6 inch top plate and 3/4 inch diameter bolt, by length required for thickness of paver

C. Standard Roof Pavers (**PAV-01**): Heavyweight, hydraulically pressed, concrete units, square edged, factory cast for use as roof pavers; and complying with the follow requirements:

1. Size: Panel size as shown on drawings, thickness required for panel size and weight required comply with performance criteria. Provide 24 by 24 x thickness required to counteract flotation and uplift, where size is not shown. Manufacture pavers to dimensional tolerances of plus or minus 1/16 inch in length, height, and thickness.
2. Weight: minimum18 lb./sq. ft. within field and minimum 22 lbs/sq. ft. at perimeter, or heavier as necessary to comply with Dow Technote 508.1.
3. Flexural Strength: 1100 psi.
4. Absorption: Less than 5%. per ASTM C140.
5. Density: 155 lb./ ft.3.
6. Compressive Strength: 7500 psi, minimum; ASTM C140.
7. Freeze/Thaw Resistance: No breakage and maximum 1 percent mass loss per ASTM C1782.
8. Colors and Textures: <**insert color and texture**>.
9. Finish: Tudor finish
10. Emittance: 0.90 in accordance with ASTM 408
11. Solar Reflectance Index (SRI): Minimum 78, and a three-year, aged Solar Reflectance Index of not less than 64 when calculated in accordance with ASTM E1980, based on testing identical products by a qualified testing agency.
12. Manufacturer: One of the following:

    a. "Energy star compliant and high emissivity pedestal pavers" (Hanover Architectural Products.)
    b. "Terra Paver Type H Cool Pavers" ((Wausau Tile, Inc.)

D. Adjustable Leveling Paver Pedestal Supports: Provide the following:

1. "Terra-Adjust Pedestals" (Wausau Tile, Inc.); components fabricated from SBR rubber consisting of 6-1/8 in. dia. adjustable pedestals with a base contact area of 29-1/2 in2, extenders, rubber spacers, and reducers. Utilize reducers for areas under 2 in. in height and extenders for areas over 5-/12 in. in height.
2. “Bison ScrewJack Pedestal Systems” (United Construction Products), consisting of pedestal supports fabricated from injection molded polystyrene with screw mechanism and integrated spacing tabs, coupler extenders and EPDM leveler pads

E. Paver Supports: "Terra-Tabs" (Wausau Tile, Inc.) or approved equivalent, consisting of 7 in. x 7 in. x 1/2 in thick SBR rubber unit with 3/16 in. location tabs complete with 1/8 in. thick SBR rubber shims, pads, spacer tabs and integral corner pedestals.

F. Roof-Paver Metal Straps: Securement strapping fabricated from stainless steel, a minimum of 2 inches wide by 0.031-inch-thick with stainless-steel anchors or other corrosion-resistant, post-installed expansion anchors approved by insulation manufacturer.

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2.12 GREEN TOPPINGS

A. **G1:** Green Roof, Sedum, by Sika Corporation, American Hydrotech

B. **G2:** Green roof permeable pavers, "Checkerblock, 24”X24” (Sika Corporation, American Hydrotech) connecting permeable paver with filigree design to be filled with grass and sedum.

C. **[G3] Planting:** for planting selection refer to landscape drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies 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 minimum concrete drying period recommended by roofing system manufacturer has passed.
4. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
5. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
6. Perform membrane adhesion test to verify that roof deck surface is acceptable for installation of specified fluid applied protected membrane roofing system.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Manufacturer’s Representation: The manufacturer of the roofing membrane and the applicator shall inspect the first pour of concrete substrate to review the acceptability of the concrete for application of the roofing system. Verify that curing compounds or surface hardeners incompatible with insulated membrane garden roofing system have not been used on concrete surfaces. Verify that slope of concrete substrate is acceptable for application of hot fluid applied reinforced membrane roofing in an inverted membrane installation.

3.2 PREPARATION

A. 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.

B. Piping, Conduit and Other Penetrations: Do not proceed with work of this Section until drains, piping, conduit, vents, ducts and other projections through the substrate have been installed and waterproofed with appropriate type flashing.

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3.3 INSULATION INSTALLATION

A. Loosely lay board insulation units over roofing membrane, with long joints of insulation in continuous straight lines and with end joints staggered between rows. Abut edges and ends between units.

B. Install one or more layers of insulation to achieve required thickness over roofing membrane. Cut and fit to within 3/4 inch of projections and penetrations.

1. Where overall insulation thickness is 2 inches or more, install required thickness in two or more layers with joints of each succeeding layer staggered over joints of previous layer a minimum of 6 inches in each direction.

C. Install water pervious geotextile filter fabric over insulation, in accordance with the roofing membrane manufacturer's printed instructions. Install fabric mat over insulation, overlapping edges and ends at least 12 inches. Do not lap ends of fabric sheets within 72 inches of roof perimeter. Extend fabric 2 to 3 inches above ballast at perimeter and penetrations. Apply additional layer of fabric around penetrations to prevent aggregate from getting between penetration and insulation. Do not cover drains or restrict water flow to drains.

D. Drainage Course: Install three dimensional molded panels in accordance with manufacturer's requirements.

3.4 ROOF-PAVER INSTALLATION

A. Precast Pavers: As soon as possible after insulation is installed, but in no case exceeding the maximum time of exposure of the insulation permitted by the insulation manufacturer, apply precast units and pedestal supports at each corner directly over water pervious fabric in areas as shown and in accordance with final shop drawings.

B. Install roof pavers over roofed area according to insulation manufacturer's written instructions. Mechanically fasten roof-paver with cornerlock system as required to comply with uplift pressures and as determined by roofing contractor's signed and sealed calculations and Dow Technote 508.1. Use metal straps to center of first perimeter and first perimeter corner row of roof pavers where cornerlock panels cannot be used.

C. Establish grid system matching grid system shown. Provide pedestals and shims (where indicated) at each corner of each paver to provide a level surface which will result in a level paver system.

D. Where precast units terminate short of vertical surfaces or penetrations exposing insulation to UV degradation, cover exposed water pervious fabric and insulation with gravel flush with surface of pavers.

E. Provide 1 in. to 1-1/2 in. of gravel adjacent to and surrounding drains and scuppers. In areas where entire roof is covered with precast ballast, cut precast pavers precisely around penetrations to form a tight joint and totally covering insulation and roof membrane

F. Lay out pattern of precast units so that units terminate on an even line no more than 2 in. from the vertical surface or penetration, cutting units as necessary.

G. Install roof pavers on pedestals set according to manufacturer's written instructions.

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3.5 ROOF GARDEN INSTALLATION

A. Protection Sheet/Root Barrier in areas as Scheduled for Roof Garden System: Install while flexible membrane is warm, lapping joints a minimum of 4 in. to ensure complete coverage. The protection sheet/root stop barrier shall be turned up all vertical, roofed/flashed surfaces to completely protect roofing and flashings. Apply manufacturer's standard root growth regulator to all seam lap edges, Cover separator/protection sheet immediately with insulation.

B. Drainage Course in areas as Scheduled for Roof Garden System: Install three dimensional molded panels in accordance with manufacturer's requirements. Place expanded shale directly over drainage system at specified depth to meet fill and grade shape requirement. Cover expanded shale with filter cloth before placing soil mix or surface treatment.

C. Moisture Retention Mat. Provide a layer of moisture retention mat installed over the protection sheet/root barrier or drainage course layer/ insulation, lapping adjacent rolls a minimum of 4 in. The moisture retention mat shall be turned up all vertical, roofed/flashed surfaces a minimum of 6 in. beyond the anticipated soil level. Any excess shall be trimmed down to the level of the soil.

D. Drainage Inspection Devices: Provide drain inspection device over each drain within the soft landscape area. The drainage layer shall be close butted to the base of the inspection device. The filter sheet shall be dressed up all sides of the inspection device to soil level. Provision shall be made to install and form a barrier between the vegetation and all vulnerable roof details, i.e. at parapets, outlets, vent pipes etc. The barrier must be a minimum of 12 in. wide, and consist of large rounded aggregate 5/8 in. to 1-1/4 in.

E. Soil Installation

1. Soil shall be placed carefully to avoid damage or displacement of other materials such as walls, paving, drainage components, filter fabric, and roofing membrane.
2. Soil shall be placed to within 1 in. greater than final grade or to a depth of no greater than 8 in. and compacted. For final grades less than 8 in. only one round of compaction shall be performed and remaining soil loosely placed such that top of soil exceeds final grade by 1 in. For final grades greater than 8 in., place soil at no greater than 6 in. and repeat procedure until soil has been compacted within 1 in. of final grade.
3. Compaction shall be performed with a 200 lb. – 300 lb. landscape roller or lightly compacted with a hand held mechanical compactor to achieve a 50% – 60% compaction as determined by ASTM D1557. After compaction remaining soil shall be placed at 1 in. greater than final grade and thoroughly watered or jetted over entire area. Low settled areas shall be filled with additional soil and re-wet to achieve uniform prescribed final grade.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Fluid applied protected membrane and garden roofing subcontractor shall engage manufacturer's technical personnel for a minimum of 3 times during installation of system.

1. Substrate and surface preparation.
2. First application of waterproofing membrane, intermediate inspections as work progresses, and completed installation including membrane, flashings, protection, and drainage components.
3. Submit written reports of each inspection to Owner,Architect, and the Commissioning Agent.

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B. Testing Agency: Fluid applied protected membrane and garden roofing subcontractor shall engage a qualified testing agency to observe flood tests and to determine and report leaks.

C. Testing: Perform one of the following tests:

1. Electronic Water Testing (EFVM): Provide testing in accordance with ASTM D7877-14 "Electronic Methods for Detecting and Locating Leaks in Waterproof Membranes". Perform leak testing by an electronic detection process (Electric Field Vector Mapping) administered by a qualified testing agency as follows:

a. Test the entire roofing membrane on an area-by-area basis as required by the conduct of the Work. Install stationary impulse conductor wire around perimeter of area to be tested. The testing agency will determine size and shape of area. Provide conductor wire consisting of braided polyethylene 1/16 in. interwoven with a minimum of six strands of stainless steel wire. Place conductor wire 6 in. from perimeter and secure against accidental movement or damage. Place wire directly on membrane. Isolate metal items contacting the membrane by placing four to six additional stands of conductor wire to isolate the field or by removing the metal items temporarily if possible.

b. Wet the membrane test area with water or other suitable conductor fluid prior to start of each test and maintain wet for duration of testing. Utilizing a potentiometer and two probes placed at the surface of the membrane detect the presence or absence of electrical flow across the surface of the membrane. Verify integrity of the membrane at drains and penetrations by localized testing. Such water electronic testing may be conducted on an area by area basis as the Work permits but in no case shall less than 100% of the roof membrane be tested. If leaks occur, remove existing components and replace with new materials to eliminate the causes and sources of the leaks.

c. Provide a report of each day’s test results containing a written description and photograph of defects and any corrections made and a schematic CAD drawing indicating location of stationary conductor wire and of any defects found in testing to within 1 inch) of accuracy.

d. 100% of roofing shall be tested.

D. Correct deficiencies in, repair or remove and replace roofing system where inspections indicate that they do not comply with specified requirements.

1. After flood tests, repair leaks and make further repairs until roofing installation is watertight.

E. Final Roof Inspection: Fluid applied protected membrane and garden roofing subcontractor shall Arrange for roofing system manufacturer's technical personnel to inspect completed roofing installation on completion of roofing membrane and flashing, before covering with other construction and provide written report that installation complies with manufacturer's written instructions.

1. Notify Architect and Owner 48 hours in advance of date and time of final inspection.

F. Additional testing and inspections, at Subcontractor's expense, will be performed to determine compliance of replaced or additional corrective Work with requirements.

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3.7 CLEANING AND PROTECTION

A. Protect roofing according to manufacturer's written recommendations to prevent damage and wear during application and remainder of construction period. When remaining construction does 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. Protect installed insulation from damage due to UV light, 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.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075555

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SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Formed roof-drainage sheet metal fabrications.
2. Formed low-slope roof sheet metal fabrications.
3. Wall sheet metal flashing.
4. Formed equipment support flashing.

C. Related Requirements:

1. Division 07 Roofing sections.
2. Division 07 Section “Flexible Flashings.”
3. Division 07 Section “Roof Specialties.”
4. Division 07 Section “Roof Accessories.”

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code**.**

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

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1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following

1. Underlayment materials.
2. Elastomeric sealant.
3. Butyl sealant.
4. Epoxy seam sealer.

B. Sustainable Design Submittals:

1. Product Data: For sealants and coatings wet applied, indicating VOC content.
2. Laboratory Test Reports: For sealants and coatings wet applied, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches (1:5).

D. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.

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3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Sustainability Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Data: For recycled content of product, separately identifying the percentage of pre-consumer (post-industrial) recycled content and percentage of post-consumer recycled content.
3. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
4. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

B. Special warranty.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

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1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows 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 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
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. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent 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: 120 degree F (67 degree C), ambient; 180 degree F (100 degree C), material surfaces.

D. Low-Emitting Materials:

1. Interior sealants and coatings wet-applied onsite must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. Interior sealants and coatings wet-applied onsite must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4/v4.1 BD+C: New Construction".

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

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B. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Exposed Coil-Coated Finish:

a. Superior-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish system consisting of corrosion inhibitive primer, fluoropolymer color coat and clear fluorocarbon topcoat, complying with AAMA 2605 and AA-C12C42R1x, containing not less than 70 percent PVDF resin by weight in color coat, in not less than 1.2 mils dry film thickness.

1) Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2) Color and Gloss: Custom color; match Architect's control Sample.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive for installation under copings and roof counter flashing, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D1970; stable after testing at 240 degree F
2. Low-Temperature Flexibility: ASTM D1970; passes after testing at minus 20 degree F (29

3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle Coatings & Waterproofing; CCW WIP 300HT.
b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
c. Henry Company; Blueskin PE200 HT.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.

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c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

D. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

H. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. 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.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

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D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Seams:

1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper. Fabricate from the following materials:

1. Aluminum: 0.032 inch (0.81 mm) thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Aluminum: 0.040 inch (1.02 mm) thick.

B. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Aluminum: 0.032 inch (0.81 mm) thick.

C. Flashing Receivers: Fabricate from the following materials:

1. Aluminum: 0.032 inch (0.81 mm) thick.

D. Roof-Penetration Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.0188 inch (0.477 mm) thick.

2.8 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- (2400-mm) long, but not exceeding 12-foot- (3.6-m) long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches (150 mm) beyond each side of wall openings; and form with 2-inch- (50-mm) high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.0156 inch (0.396 mm) thick.

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2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.0188 inch (0.477 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering Sheet Underlayment: Install wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water. Overlap edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

B. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

1. Install in shingle fashion to shed water.
2. Lap joints not less than 4 inches (100 mm).

3.3 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced not more than 12 inches (300 mm) o.c.
6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
7. Do not field cut sheet metal flashing and trim by torch.

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B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated.

a. Form joints to completely conceal sealant.
b. When ambient temperature at time of installation is between 40 and 70 degree F (4 and 21 degree C), set joint members for 50 percent movement each way.
c. Adjust setting proportionately for installation at higher ambient temperatures.

1) Do not install sealant-type joints at temperatures below 40 degree F (4 degree C).

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.4 INSTALLATION OF ROOF-DRAINAGE SYSTEM

A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Parapet Scuppers:

1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
2. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.

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3. Loosely lock front edge of scupper with conductor head.

3.5 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless steel draw band and tighten.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.

1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
2. Extend counterflashing 4 inches (100 mm) over base flashing.
3. Lap counterflashing joints minimum of 4 inches (100 mm).
4. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

3.6 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.7 INSTALLATION OF MISCELLANEOUS FLASHING

A. Equipment Support Flashing:

1. Coordinate installation of equipment support flashing with installation of roofing and equipment.
2. Weld or seal flashing with elastomeric sealant to equipment support member.

B. Overhead-Piping Safety Pans:

1. Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings.
2. Pipe and install drain line to plumbing waste or drainage system.

3.8 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

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3.9 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

3.10 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in 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, as determined by Architect.

END OF SECTION 076200

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SECTION 076500 - FLEXIBLE FLASHING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Self-adhering, vapor-retarding, flexible flashing membranes designed for use around wall openings on above grade, vertical wall surfaces.

C. Related Requirements:

1. Division 07 Section “Sheet Metal Flashing and Trim.”
2. Division 07 Section “Joint Sealants.”

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code**.**

1.3 SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, specifications, installation instructions, recommendations, and tested physical and performance properties of products.

B. Shop Drawings:

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1. Show locations and extent of flexible membrane flashing. 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 flashing.
3. Include 3-dimensionsal axonometric views of inside corners, outside corners, transitions and interfaces with other materials.
4. For primers indicating VOC content.

C. Samples: For the following products:

1. 12-by-12-inches square of each type of flashing membrane.
2. 12-by-12-inches square of each type of transition membrane.

D. Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of each type of flexible flashing membrane for compliance with requirements, based on comprehensive testing of current flashing formulations.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who is authorized, approved, or licensed by flashing membrane manufacturer to install manufacturer's products.

B. Manufacturer Qualifications: A qualified manufacturer who has successfully produced work similar in design and extent to that required for the project, in not less than three projects of similar scope to the satisfaction of the Architect, and whose work has resulted in installations with a record of successful in-service performance for a period of not less than 10 years.

C. Source Limitations: Obtain flashing materials, transition membranes, primers, adhesives, sealants, and other materials, through one source from a single manufacturer.

D. Preinstallation Conference: Conduct conference at Project site.

1. Review flashing requirements and installation, special details, flashing protection, and work scheduling that covers flashings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original containers with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, shelf life, 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 flashing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Protect stored materials from direct sunlight.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver prepackaged materials in manufacturer's original unopened packaging with labels intact. Packaging or containers shall fully identify brand, type, grade, class, and other qualifying information used to describe contents.

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B. Storage:

1. Materials that are susceptible to retaining moisture or that may be damaged by moisture shall be stored in a dry location before application. Moisture-sensitive materials shall be stored in enclosed areas protected from moisture or elevated humidity.
2. Store membrane rolls lying down.
3. Stack materials on pallets or platforms that are raised off ground or substrate.
4. Cover materials in a manner to provide air circulation and to prevent damage to surfaces.
5. Store sealants, adhesives, and mastics at temperatures above 40 degrees F.
6. Store flammable materials in a cool dry area away from sparks and open flames. Follow precautions outlined on container or supplied by material manufacturer/supplier.
7. Materials determined by Design Consultant, and/or manufacturer's field representative to be damaged shall be removed from site and replaced at no cost to Owner.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

B. Coordination: Interface flashing work with adjacent and adjoining work to ensure best possible weather resistance and durability of completed flashing.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Apply flashing materials within the range of ambient and substrate temperatures recommended by flashing manufacturer. Do not apply flashings to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.

1. Protect substrates from environmental conditions that affect flashing performance.
2. Do not apply flashing to a damp or wet substrate or during snow, rain, fog, or mist.

B. Maintain adequate ventilation during application and curing of flashing materials.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Connections to Adjacent Materials: Provide connections to prevent air leakage at the following locations:

1. Walls, including penetrations, ties and anchors.
2. Walls, windows, curtain walls or doors.
3. Different wall assemblies, and fixed openings within those assemblies.
4. Wall and roof connections.
5. Wall control and expansion joints.
6. Wall pipe and duct penetrations.
7. Wall expansion joints.

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2.2 BITUMINOUS FLEXIBLE FLASHING MEMBRANE

A. Flexible Flashing Membrane: 40-mil, self-adhesive flashing for cavity wall applications. Consisting of 32 mil of rubberized asphalt integrally bonded to an 8 mil, high-density, cross laminated polyethylene film.

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

    a. GCP, “Perm-A-Barrier Wall Flashing.”
    b. Henry Company, “Blueskin TWF.”
    c. Tremco Construction Products Group, “ExoAir 110/110LT.”

2. Physical and Performance Properties:

    a. Membrane Thickness: 30-mils.
    b. Film Thickness: 8 mils.
    c. Puncture Resistance: 80 lbf. minimum.
    d. Tear Resistance: 13 lbf. initiation per ASTM D1004.
    e. Tensile Strength: 800 psi per ASTM D412, Die C Modified.
    f. Low Temperature Flexibility: Minus 22 degrees F, per ASTM D1970.

2.3 FLEXIBLE METAL SHEET FLASHINGS

A. Flexible Metal Sheet Membrane: Self-adhering, composite metal membrane composed of un-coated (bare) stainless steel sheet, butyl adhesive, and siliconized release liner; inherently compatible air barrier sheets, membranes, and coatings, and requiring no substrate surface primers prior to installation.

1. Stainless Steel Sheet: ASTM A240/A240M, Type 304 alloy, 2 mil, 0.002 inch thick; smooth No. 4 (matte) finish.

    a. Sheet Width: Minimum 4 inch unless wider sheets are required to suit indicated applications.

2. Butyl Adhesive: 0.010 inch thick; applied continuously to back of stainless steel sheet; adhesive includes embedded 0.004 inch thick polyethylene sheet interlayer.
3. Air Permeability: Pass; tested according to ASTM E2178.
4. Vapor Retarder Classification: Class 1, less than 0.1 perm; tested in accordance with ASTM E96/E96M.
5. Puncture Resistance: 2,500 psi, minimum; tested in accordance with ASTM E154/E154M.
6. Fastener Sealability: Pass; tested in accordance with AAMA 711.
7. Peel Adhesion to Substrates: Minimum 3.5 lbf/in on application substrates; minimum 6.7 lbf/in for products applied to stainless steel air barrier membrane surfaces; tested in accordance with ASTM D903.
8. Surface Burning Characteristics: Pass, Class A; tested in accordance with ASTM E84.
9. Mold Resistance: Pass; tested in accordance with ASTM D3273.

B. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following:

1. Momentive Performance Materials, Inc.
2. VaproShield, LLC.
3. York Manufacturing, Inc.

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C. Basis of Design Product:

1. York Manufacturing, Inc., “York 304 SA.”

D. Accessory Components: As recommended by manufacturer for indicated applications.

2.4 ACCESSORY MATERIALS

A. General: Accessory materials recommended by flashing manufacturer to produce a complete flashing assembly and compatible with primary flashing membrane.

B. Primer: Liquid waterborne primer recommended for substrate by flexible flashing material manufacturer.

1. VOC Content: 100 g/L or less.

C. Counterflashing Strip: Same as Flexible Flashing Membrane.

D. Sheet Flashing: Refer to Division 07 Section "Sheet Metal Flashing and Trim."

E. Termination Mastic: Flashing manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

F. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

G. Adhesive and Tape: Flashing manufacturer's standard adhesive and pressure-sensitive adhesive tape.

H. Stainless-Steel Sheet: ASTM A240/A240M, Type 304, 0.64 mm thick, and Series 300 stainless-steel fasteners.

I. Sprayed Polyurethane Foam Sealant: 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 E162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

J. Joint Sealant: ASTM C920, 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 flashing manufacturer.
3. Verify that concrete is visibly dry and free of moisture.

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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 flashing application.

B. Mask off adjoining surfaces 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 D4258.

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 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 flashing.

3.3 INSTALLATION

A. General: Install modified bituminous flashing and accessory materials according to flashing manufacturer's written instructions and according to recommendations in ASTM D6135.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous flashing 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 D6135.

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 D6135.

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D. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by flashing sheet on same day. Reprime areas exposed for more than 24 hours.

E. Apply continuous modified bituminous sheets over modified bituminous strips bridging substrate cracks, construction, and contraction joints.

F. Seal top of flexible flashings to flashing sheet with an additional 6-inches- wide, counterflashing strip.

G. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

H. Install flashing sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous flashing.

I. Connect and seal exterior wall flashing membrane continuously to exterior glazing and window systems, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

J. Wall Openings: Prime concealed, perimeter frame surfaces of windows, and doors. Apply modified bituminous strip 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 Strip: Roll firmly to enhance adhesion.

K. Fill gaps in perimeter frame surfaces of windows, doors, and miscellaneous penetrations of flashing membrane with foam sealant.

L. At end of each working day, seal top edge of flashing material to substrate with termination mastic.

M. Apply joint sealants forming part of flashing assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

3.4 FIELD QUALITY CONTROL

A. Inspections: Flashing materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of flashing system has been achieved throughout the building envelope with no gaps or holes.
2. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
3. Site conditions for application temperature and dryness of substrates have been maintained.
4. Maximum exposure time of materials to UV deterioration has not been exceeded.
5. Surfaces have been primed.
6. 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.
7. Termination mastic has been applied on cut edges.
8. Flashing has been firmly adhered to substrate.
9. Compatible materials have been used.

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10. Transitions at changes in direction and structural support at gaps have been provided.
11. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
12. All penetrations have been sealed.

3.5 CLEANING AND PROTECTION

A. Protect flashing system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect flashing from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for longer period than included in manufacturer’s recommendations, remove and replace flashing or install additional, full-thickness, flashing application after repairing and preparing the overexposed membrane according to flashing manufacturer's written instructions.
2. Protect flashing from contact with incompatible materials and sealants not approved by flashing 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 076500

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SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Copings.
2. Roof-edge specialties.
3. Roof-edge drainage systems.
4. Reglets and counterflashings.

C. Related Requirements:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
3. Division 07 Section "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code**.**

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

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1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

C. Samples: For each type of roof specialty and for each color and texture specified.

D. Samples for Verification:

1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
2. Include copings, roof-edge specialties, roof-edge drainage systems, and reglets and counterflashings made from 12-inch (300-mm) lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Sustainability Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Data: For recycled content of product, separately identifying the percentage of pre-consumer (post-industrial) recycled content and percentage of post-consumer recycled content.
3. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
4. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

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C. Product Certificates: For each type of roof specialty.

D. Product Test Reports: For copings and roof-edge flashings, for tests performed by a qualified testing agency.

E. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are FM Approvals listed for specified class and SPRI ES-1 tested to specified design pressure.

1.8 MOCKUPS

A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of typical roof edge as part of Integrated Exterior Mockup specified in Division 01 Section "Quality Requirements."
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Roofing-System Warranty: Roof specialties are included in warranty provisions in roofing Sections.

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B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show 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 Delta E units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
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 SOURCE LIMITATIONS

A. Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in roofing Section.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. FM Approvals' Listing: Manufacture and install roof-edge specialties that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.

D. SPRI Wind Design Standard: Manufacture and install roof-edge specialties tested according to SPRI ES-1 and capable of resisting the following design pressures:

1. Design Pressure: As indicated on Drawings.

E. Florida Product Approvals Listing: Manufacture and install copings that are listed as Florida Product Approvals.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent 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 thermal movements. 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.3 MATERIALS, GENERAL

A. Recycled Content of Products:

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1. Provide products with an average recycled content of aluminum products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 12.5 percent.
2. Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

2.4 COPINGS

A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet (3.6 m), concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Architectural Products Company.
    b. Metal-Era, Inc.
    c. PAC-CLAD; Petersen Aluminum Corporation; a Carlisle company.
    d. SAF (Southern Aluminum Finishing Company, Inc.).

2. Basis of Design Product: PAC-CLAD; Petersen Aluminum Corporation; a Carlisle company “PAC-TITE Coping: Tapered.”
3. Formed Aluminum Sheet Coping Caps: Aluminum sheet, thickness as required to meet performance requirements.

    a. Surface: Smooth, flat finish.
    b. Finish: Two-coat fluoropolymer.

4. Corners: Factory mitered and continuously welded.
5. Special Fabrications: Radiused sections.
6. Coping-Cap Attachment Method: Snap-on, fabricated from coping-cap material.

    a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches (300 mm) wide, with integral cleats.

2.5 ROOF-EDGE SPECIALTIES

A. One-Piece Gravel Stops: Manufactured, one-piece, metal gravel stop in section lengths not exceeding 12 feet (3.6 m), with a horizontal flange and vertical leg, drain-through fascia terminating in a drip edge, and concealed splice plates of same material, finish, and shape as gravel stop. Provide matching corner units.

1. :Manufacturers: Subject to compliance with requirements, provide products manufactured by one of the following:

    a. Architectural Products Company.
    b. Metal-Era, Inc.
    c. PAC-CLAD; Petersen Aluminum Corporation; a Carlisle company.
    d. SAF Perimeter Systems Division.

2. Formed Aluminum Sheet Gravel Stops: Aluminum sheet, thickness as required to meet performance requirements.

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a. Surface: Smooth, flat finish.
b. Finish: Two-coat fluoropolymer.

2.6 ROOF-EDGE DRAINAGE SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products manufactured by one of the following:

1. Architectural Products Company.
2. Metal-Era, Inc.
3. PAC-CLAD; Petersen Aluminum Corporation; a Carlisle company.
4. SAF Perimeter Systems Division.

B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet (3.6 m), with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch (25 mm) above front edge. Furnish accessories fabricated from same metal as gutters.

1. Aluminum Sheet: 0.063 inch (1.60 mm) thick.
2. Gutter Profile: As indicated on Drawings.
3. Corners: Factory mitered and continuously welded.
4. Gutter Supports: Manufacturer's standard supports as selected by Architect with finish matching the gutters.
5. Special Fabrications: Radiused sections.
6. Gutter Accessories: As indicated on Drawings.

C. Downspouts: Plain rectangular complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Formed Aluminum: 0.063 inch (1.60 mm) thick.

D. Conductor Heads: Manufactured conductor heads, each with flanged back and stiffened top edge, and of dimensions and shape indicated, complete with outlet tube that nests into upper end of downspout, exterior flange trim, and built-in overflow.

1. Formed Aluminum: 0.032 inch (0.81 mm) thick.

E. Aluminum Finish: Two-coat fluoropolymer.

2.7 REGLETS AND COUNTERFLASHINGS

A. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following:

1. Fry Reglet Corporation.
2. Heckmann Building Products, Inc.
3. Keystone Flashing Company, Inc.
4. Metal-Era, Inc.; CF Series.
5. OMG Roofing Products; a Division of OMG, Inc., a subsidiary of Steel Partners Holdings L.P.

B. Basis of Design Product: Fry Reglet Corporation, “Fry SM Reglet.”

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C. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:

1. Zinc-Coated Steel: Nominal 0.028-inch (0.71-mm) thickness.
2. Corners: Factory mitered and continuously welded.
3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

D. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches (100 mm) and in lengths not exceeding 12 feet (3.6 m) designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal:

1. Zinc-Coated Steel: Nominal 0.028-inch (0.71-mm) thickness.

E. Accessories:

1. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

F. Zinc-Coated Steel Finish: Two-coat fluoropolymer.

1. Color: Custom color, match Architect's control sample.

2.8 MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 (Z275) coating designation.

B. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

C. Aluminum Extrusions: ASTM B221 (ASTM B221M), alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:

2.9 UNDERLAYMENT MATERIALS

A. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum.

2.10 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.

B. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

C. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

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

2.11 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: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Coil-Coated Aluminum Sheet Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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 for seacoast and severe environments.
    b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

E. Aluminum Extrusion Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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.
    b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

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 the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

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D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

3.3 INSTALLATION, GENERAL

A. Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum and stainless steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet (3.6 m) with no joints within 18 inches (450 mm) of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F (4 deg C).

3.4 INSTALLATION OF COPINGS

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

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B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at 30-inch (762-mm) centers, maximum, or at manufacturer's required spacing that meets performance requirements.

3.5 INSTALLATION OF ROOF-EDGE SPECIALITIES

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.6 INSTALLATION OF ROOF-EDGE DRAINAGE SYSTEMS

A. Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 30 inches (762 mm) apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.

1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet (15.2 m) apart. Install expansion-joint caps.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c.

1. Provide elbows at base of downspouts at grade to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

D. Conductor Heads: Anchor securely to wall with elevation of conductor top edge 1 inch (25 mm) below gutter discharge.

3.7 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 roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

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END OF SECTION 077100

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SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Roof curbs.
2. Equipment supports.
3. Roof hatches.
4. Pipe portals.
5. Preformed flashing sleeves.

C. Related Requirements:

1. Division 05 Section "Metal Fabrications" for metal vertical ladders and ships' ladders for access to roof hatches.
2. Division 05 Section "Pipe and Tube Railings" for safety railing systems not attached to roof-hatch curbs.
3. Division 07 Section "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.2 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

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D. Delegated-Design Submittal: For roof curbs and equipment supports 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 mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.4 INFORMATIONAL SUBMITTALS

A. 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.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

B. Florida Product Approval Reports: One of the following:

1. Florida Building Commission Product Approval Evaluation Report: For roof accessories systems, from the Florida Building Commission Product Approval Section.
2. Miami-Dade County Product Control Section Notice of Acceptance (NOA): For roof accessories systems, from the Miami-Dade County Product Control Section.

C. Sample Warranties: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.6 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show 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 Delta units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

A. Fabrication Engineering and Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements." Provide a comprehensive engineering analysis based on design criteria and performance requirements indicated.

B. Wind-Restraint Performance: As follows:

1. Wind Loads: Determine wind loads according to the Florida Building Code, Eighth Edition (2023).

C. Florida Product Approval Listing: One of the following:

1. Florida Building Commission Product Approval Listing: Roof accessories and component materials shall comply with requirements in the Florida Building Code, Seventh Edition (2020), as part of a roof accessories system, and shall be listed in the Florida Building Commission's Product Approval Listing for roof accessories assembly identical for that specified for this Project.
2. Miami-Dade County Product Control Section Notice of Acceptance (NOA) Listing: Roof accessories and component materials shall comply with requirements in the Florida Building Code, Seventh Edition (2020), as part of a roof accessories system, and shall be listed in the Miami-Dade County Product Control Section Notice of Acceptance (NOA) Listing for roof accessories assembly identical for that specified for this Project.

2.2 ROOF CURBS

A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom.

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

a. Roof Products, Inc.
b. ThyCurb; Div. of Thybar Corporation.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.

D. Material: Zinc-coated (galvanized) steel sheet, 0.079 inch thick.

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1. Finish: Baked enamel or powder coat.
2. Color: As selected by Architect from manufacturer's full range.

E. Construction:

1. Curb Profile: Manufacturer's standard compatible with roofing system.
2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
3. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
4. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange.
5. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
6. Insulation: Factory insulated with 1-1/2-inch- thick glass-fiber board insulation.
7. Liner: Same material as curb, of manufacturer's standard thickness and finish.
8. Nailer: Factory-installed wood nailer along top flange of curb, continuous around curb perimeter.
9. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to meet wind uplift requirements.
10. Platform Cap: Where portion of roof curb is not covered by equipment, provide weathertight platform cap formed from 3/4-inch-thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
11. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

2.3 EQUIPMENT SUPPORTS

A. Equipment Supports: Internally reinforced perimeter metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, stepped integral metal cant raised the thickness of roof insulation, and integrally formed structure-mounting flange at bottom.

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

a. Roof Products, Inc.
b. ThyCurb; Div. of Thybar Corporation.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.

D. Material: Zinc-coated (galvanized) steel sheet, 0.079 inch thick.

1. Finish: Baked enamel or powder coat.
2. Color: As selected by Architect from manufacturer's full range.

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E. Construction:

1. Curb Profile: Manufacturer's standard compatible with roofing system.
2. Insulation: Factory insulated with 1-1/2-inch- thick glass-fiber board insulation.
3. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
4. Nailer: Factory-installed continuous wood nailers 3-1/2 inches wide on top flange of equipment supports, continuous around support perimeter.
5. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb of size and spacing required to meet wind uplift requirements.
6. Platform Cap: Where portion of equipment support is not covered by equipment, provide weathertight platform cap formed from 3/4-inch-thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
7. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
8. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
9. Fabricate equipment supports to minimum height of 12 inches above roofing surface unless otherwise indicated.
10. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.

2.4 ROOF HATCHES (RA-XX)

A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom.

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

   a. BILCO Company (The).
   b. Milcor; Commercial Products Group of Hart & Cooley, Inc.
   c. Nystrom, Inc.

B. Type and Size:

1. General: Comply with OSHA Standard CFR 29 Part 1910.27.
2. Ladder Access: Single-leaf lid, 36 by 37 inches.

C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.

D. Hatch Material: Aluminum sheet.

1. Thickness: 0.125 inch.
2. Finish: Baked enamel or powder coat.
3. Color: As selected by Architect from manufacturer's full range.

E. Construction:

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1. Insulation: 1-inch-thick, glass-fiber board.

    a. R-Value: 2.78 according to ASTM C1363.

2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
5. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
6. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
7. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.

F. Hardware: Spring operators, hold-open arm, stainless steel spring latch with turn handles, stainless steel butt- or pintle-type hinge system, and padlock hasps inside and outside.

1. Provide two-point latch on lids larger than 84 inches.

G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.

1. Height: 42 inches above finished roof deck.
2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
5. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
6. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
7. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
8. Fabricate joints exposed to weather to be watertight.
9. Fasteners: Manufacturer's standard, finished to match railing system.
10. Finish: Manufacturer's standard.

    a. Color: As selected by Architect from manufacturer's full range.

H. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches above finished roof deck.
3. Material: Stainless steel.
4. Post: 1-5/8-inch- diameter pipe.
5. Finish: Manufacturer's standard baked enamel or powder coat.

    a. Color: As selected by Architect from manufacturer's full range.

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2.5 PIPE PORTALS

A. Curb-Mounted Pipe Portal: Insulated roof-curb units with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom; with weathertight curb cover with single or multiple collared openings and pressure-sealed conically shaped EPDM protective rubber caps sized for piping indicated, with stainless steel snaplock swivel clamps.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Portals Plus; a division of Hart & Cooley, Inc..
    b. Roof Products and Systems (RPS); a division of Hart & Cooley, Inc..

B. Flashing Pipe Portal: Formed aluminum membrane-mounting flashing flange and sleeve with collared opening and pressure-sealed conically shaped EPDM protective rubber cap sized for piping indicated, with stainless steel snaplock swivel clamps.

1. Products: Subject to compliance with requirements, provide the following:
    a. Portals Plus; a division of Hart & Cooley, Inc..

2.6 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 coating designation.

1. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.
2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

B. Aluminum Sheet: ASTM B209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

1. 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.
2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

C. Aluminum Extrusions and Tubes: ASTM B221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.

D. Stainless Steel Sheet and Shapes: ASTM A240/A240M or ASTM A666, Type 304.

E. Steel Shapes: ASTM A36/A36M, hot-dip galvanized according to ASTM A123/A123M unless otherwise indicated.

F. Steel Tube: ASTM A500/A500M, round tube.

G. Galvanized-Steel Tube: ASTM A500/A500M, round tube, hot-dip galvanized according to ASTM A123/A123M.

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H. Steel Pipe: ASTM A53/A53M, galvanized.

2.7 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Glass-Fiber Board Insulation: ASTM C726, nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F, thickness as indicated.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

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

E. Underlayment:

1. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Polyethylene Sheet: 6-mil-thick polyethylene sheet complying with ASTM D4397.
3. Slip Sheet: Building paper, 3 lb/100 sq. ft. minimum, rosin sized.
4. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

F. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

I. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

J. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum and stainless steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof Curb Installation: Install each roof curb so top surface is level.

D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.

E. Roof-Hatch Installation:

1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.

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2. Attach safety railing system to roof-hatch curb.
3. Attach ladder-assist post according to manufacturer's written instructions.

F. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A780/A780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

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SECTION 078100 - APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Sprayed fire-resistive materials.

1.2 DEFINITIONS

A. SFRM: Sprayed fire-resistive material.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content of product, separately identifying the % of pre-consumer (post-industrial) recycled content and % of post-consumer recycled content and cost.
2. Product Certificates: For materials manufactured within 100 miles (160 km) of Project, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each raw material.
3. Extended Producer Responsibility Verification: Indicating manufacturer participates in or operates a take-back or recycling program for the product purchased.
4. Product Data: For paints and coatings, indicating VOC content.
5. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Framing plans or schedules, or both, indicating the following:

1. Extent of fireproofing for each construction and fire-resistance rating.
2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
4. Treatment of fireproofing after application.

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D. Samples: For each exposed product and for each color and texture specified, 4 inches square in size.

1.5 INFORMATIONAL SUBMITTALS

A. Sustainable Design Submittal

1. Product EPDs: For each product, indicating product-specific type III or Industry wide (generic).
2. Product Ingredient Disclosure: For each product, confirming chemical inventory of products to at least 0.1% (1000 ppm).
3. Product Ingredient Optimization: For each product, confirming chemical inventory via an approved optimization program.

B. Qualification Data: For Installer and testing agency.

C. Product Certificates: For each type of fireproofing.

D. Evaluation Reports: For fireproofing, from ICC-ES.

E. Preconstruction Test Reports: For fireproofing.

F. Field quality-control reports.

G. Product Test Reports: For the following:

1. Bond Strength: ASTM E736.
2. Density: ASTM E605.
3. Combustion Characteristics: ASTM E136.
4. Surface-Burning Characteristics: ASTM E84.
5. Compressive Strength: ASTM E761.
6. Corrosion Resistance: ASTM E937.
7. Deflection: ASTM E759.
8. Effect of Impact on Bonding: ASTM E760.
9. Air Erosion: ASTM E859.
10. Fungal Resistance: ASTM G21.

H. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup approximately 100 sq. ft. of each type of fireproofing and different substrate and each required finish as shown on Drawings.

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2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on fireproofing.

1. Provide test specimens and assemblies representative of proposed materials and construction.

B. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.

1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
2. Density: Test for density according to ASTM E605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace sprayed fire-resistive materials that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of sprayed fire-resistive materials from substrates.
2. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.

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B. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Steel members are to be considered unrestrained unless specifically noted otherwise.

D. VOC Content: For field applications, coatings shall comply with VOC content limits of authorities having jurisdiction.

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50 g/L.
3. Primers, Sealers, and Undercoaters: 100 g/L.

E. Low-Emitting Materials: For field applications, coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," CDPH standard method version 1.2.

F. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

A. Sprayed Fire-Resistive Material (Interior Concealed from View) (**FP-01**): Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.

1. Products: Subject to compliance with requirements, provide one of the following. No substitutions allowed.

a. GCP Applied Technologies Inc.; Grace Construction Products; Monokote MK-10HB.
b. Isolatek International; Cafco 300 HS. (Cafco Blaze-Shield II not permitted).
c. Southwest Fireproofing Products Co.; Type 5MD.

2. Bond Strength: Minimum 430-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E736.
3. Density: Not less than density specified in the approved fire-resistance design, according to ASTM E605, but not less than 15 lb/cu. ft. average density.

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4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E605, whichever is thicker, but not less than 0.375 inch.
5. Combustion Characteristics: ASTM E136.
6. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 0.
    b. Smoke-Developed Index: 0.

7. Compressive Strength: Minimum 10 lbf/sq. in. according to ASTM E761.
8. Corrosion Resistance: No evidence of corrosion according to ASTM E937.
9. Deflection: No cracking, spalling, or delamination according to ASTM E759.
10. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E760.
11. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours according to ASTM E859.
12. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G21.
13. Finish: Spray-textured finish.

B. Sprayed Fire-Resistive Material (Interior Exposed to View) (**FP-02**): Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.

1. Products: Subject to compliance with requirements, provide one of the following. No substitutions allowed.

    a. GCP Applied Technologies Inc.; Grace Construction Products; Monokote Z106.
    b. Isolatek International; Cafco 400. (Cafco Blaze-Shield HP not permitted).
    c. Southwest Fireproofing Products Co.; Type 7GP.

2. Bond Strength: Minimum 1000-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E736.
3. Density: Not less than density specified in the approved fire-resistance design, according to ASTM E605, but not less than 22 lb/cu. ft. average density.
4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E605, whichever is thicker, but not less than 0.375 inch.
5. Combustion Characteristics: ASTM E136.
6. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 0.
    b. Smoke-Developed Index: 0.

7. Compressive Strength: Minimum 51 lbf/sq. in. according to ASTM E761.
8. Corrosion Resistance: No evidence of corrosion according to ASTM E937.
9. Deflection: No cracking, spalling, or delamination according to ASTM E759.
10. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E760.
11. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours according to ASTM E859.
12. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G21.
13. Finish: Skip-troweled finish.

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2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:

1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E736.

C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.

D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written instructions. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.

E. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.

1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.

B. Verify that concrete work on steel deck is complete before beginning fireproofing work.

C. Verify that roof construction, installation of rooftop HVAC equipment, and other related work are complete before beginning fireproofing work.

D. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.

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E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.

B. Clean substrates of substances that could impair bond of fireproofing.

C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.

1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.

D. Metal Decks:

1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, is completed.
2. Do not apply fireproofing to underside of metal roof deck until roofing is completed; prohibit roof traffic during application and drying of fireproofing.

E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

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F. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

G. Extend fireproofing in full thickness over entire area of each substrate to be protected.

H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.

I. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.

J. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.

K. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.

L. Cure fireproofing according to fireproofing manufacturer's written instructions.

M. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

N. Finishes: Where indicated, apply fireproofing to produce the following finishes:

1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
3. Skip-Troweled Finish: Even leveled surface produced by troweling spray-applied finish to smooth out the texture and neaten edges.

3.4 FIELD QUALITY CONTROL

A. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

1. Visual Inspection:

a. Prior to Application: Visually inspect all surfaces intended to receive sprayed-on fireproofing prior to its installation for conformance with the requirements of the Contract Documents.
b. After Application: Visually inspect all surfaces that received sprayed-on fireproofing work, including patched areas, for conformance with the requirements of the Contract Documents. Cracks in the fireproofing which expose the fireproofed substrate will not be permitted.
c. Final Inspection: After the work of adjacent trades has been completed, but before sprayed structural elements are enclosed, conduct a final visual inspection of sprayed-on fireproofing work.

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2. Thickness for Floor, Roof, and Wall Assemblies: For each 1000-sq. ft. area, or partial area, on each floor, from the average of 4 measurements from a 144-sq. in. sample area, with sample width of not less than 6 inches per ASTM E 605.
3. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.
4. Density for Floors, Roofs, Walls, and Structural Frame Members: For each 2,500 sq. ft. area, or partial area, on each floor, density from one sample in accordance with ASTM E 605.
5. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: For each 2,500-sq. ft. area, or partial area, on each floor, cohesion and adhesion from one sample of size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 736.
6. If testing finds applications of sprayed fire-resistive material are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.

B. Fireproofing will be considered defective if it does not pass tests and inspections.

1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

C. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.

C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.

D. Repair fireproofing damaged by other work before concealing it with other construction.

E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 078100

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SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

C. Related Requirements:

1. Division 07 Section "Fire Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.
2. Division 09 Section "Gypsum Board Assemblies" for installation of fire rated sealant and putty pads at equipment penetrating fire rated drywall construction.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Include every trade involved in the Work and the fire resistive joint systems Installer, the Owner's representative, the commissioning Agent, and the Independent Testing and Inspecting Agency, the Contractor, and the Architect. Review and discuss the following:

1. Installation clearances
2. Framing around openings
3. Minimum spacing of penetrants
4. Correct opening sizes for penetrant systems to be used
5. Penetrant materials permitted
6. Maximum number of penetrants in each opening
7. Access at both sides of penetrations for installation of fire resistive joint systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Submit manufacturer’s literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work.

B. Sustainable Design Submittals:

1. Product Data: For insulation products, indicating VOC content.
2. Product Data: For sealants wet applied, indicating VOC content.
3. Laboratory Test Reports: For sealants wet applied, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For each penetration firestopping system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction

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condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspection agency that evidences compliance with requirements for each condition indicated.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

D. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

E. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, signed and sealed approved by penetration firestopping system manufacturer's fire-protection engineer, licensed to practice in the State of the Project, as an engineering judgment or equivalent fire-resistance-rated assembly. Manufacturer shall pay for the Engineering Judgement. Obtain approval of authorities having jurisdiction prior to submittal.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Sustainable Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
3. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

C. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

D. Test reports: Certified copies of test reports (conclusions and summary only) from approved independent testing laboratories showing compliance with the Contract Documents and including current system number per UL Listing for each type of penetration firestopping system to be utilized on the project.

E. Inspection test reports: Submit copies of inspection test reports, prepared by an independent testing agency, for penetration firestop systems and perimeter fire barriers in accordance with report procedures as contained within ASTM E2174 and ASTM E2393 showing inspection results and remedial action taken, if any.

F. Building Department Acceptance: If applicable submit a copy of the Building Department acceptance sheet for each penetration firestop system submitted for each specific condition on Project.

G. Research/Evaluation Reports: For each type of fire-resistive joint system. Evidence of penetration firestop systems' compliance with ICBO ES AC30, from the ICBO Evaluation Service

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1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

A. Fire Stop Manufacturer: Do not use fire stop material produced by any manufacturer who will not agree to send a direct employee as a qualified technical representative to the project site, during the initial installation and when requested, for the purpose of training appropriate installer personnel in proper selection and installation procedures and for rendering advice concerning the proper installation of materials.

1. Acceptable Manufacturer shall employ trainers certified by one of the following associations:

    a. FM Global
    b. UL Qualified Firestop contractor Program Requirements".
    c. Firestop Contractor's International Association (FCIA).

B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements", or individual subcontractors that are trained by manufacturers with certified trainers.

1. Installation Responsibility: Assign installation and quality assurance of penetration firestopping systems and fire-resistive joint systems in Project to a single qualified installation contractor, or individuals trained by the manufacturer's certified trainers.

C. Fire-Test-Response Characteristics: Provide penetration firestopping systems that comply with the following requirements and those specified in "Performance Requirements" Article:

1. Firestopping assemblies shall be tested by a qualified testing agency. A qualified testing agency is UL, or another agency performing testing services for firestopping systems acceptable to authorities having jurisdiction in compliance with ASTM E814.
2. Penetration firestopping systems are identical to those tested per testing standard referenced in "Performance Requirements" Article. Provide rated systems bearing classification marking of qualified testing and inspecting agency.

D. Provide through penetration firestops which have been tested and listed to meet every condition in the Work. Do not provide materials or systems that are not part of a tested system, suitable for the condition; or not certified by manufacturer as an engineered deviation suitable for the condition as approved by manufacturer's qualified Fire Protection Engineer.

1. Where there is no specific third party tested and classified through penetration firestop system available for a particular configuration, the fire stop systems contractor shall submit an Engineering Judgment (EJ) or equivalent through penetration firestop rated assembly from the manufacturer's qualified Fire Protection Engineer licensed to practice in the project jurisdiction, based on an actual tested assembly. If a tested and rated through penetration firestop system exists from another manufacturer for the condition, manufacturer's engineered deviations shall not be permitted. Manufacturer shall pay for the Engineering Judgement.

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E. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

1. Comply with Florida Building Code requirements for "Fire Tests for Through Penetration Fire Stops", including referenced provisions for ASTM E814. In addition provide materials accessories and application procedures which have been approved for use in the project location.

F. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems are installed according to specified requirements.

G. Do not cover up penetration firestopping system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver penetration firestop system products and materials to the Project site in manufacturer’s original, unopened containers or packaging with intact and legible manufacturers' labels identifying product and manufacturer, brand, type, and grade, date of manufacture, lot number, shelf life if applicable, qualified testing and inspection agency's classification marking applicable to the Project, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes. Store in protected dry location off ground in accordance with manufacturer’s instructions. Do not open packaging nor remove labels until time for installation.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

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D. Do not cover up penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspection agency and building inspector, if required by authorities having jurisdiction.

1.10 WARRANTY

A. Special Warranty: Submit five (5) year written warranty signed by the manufacturer and Installer, agreeing to repair or replace Work which has shown any evidence of deterioration, failed to provide an airtight seal, failed to provide a watertight seal where required, failed in adhesion or cohesion, or otherwise failed as a result of defects in materials or workmanship. Upon notification of such defects, within the warranty period, make necessary repairs or replacement at the convenience of the Owner. Other warranties may not be substituted by the Contractor for the terms of this special warranty

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

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

    a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.

        1) UL in its "Fire Resistance Directory."

B. Low-Emitting Materials:

1. Insulation products on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. Adhesives and Sealants wet-applied on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
3. All adhesives and sealants wet-applied onsite must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4/v4.1 BD+C: New Construction”.

C. For penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture resistant penetration firestop systems
2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by floor plates or by other means.
3. For penetrations involving insulated piping, provide penetration firestop systems not requiring removal of insulation.

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4. For penetration firestopping systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

D. Sealants: All sealants used in firestopping systems shall comply with ASTM G21 for a 0 rating for mold and mildew resistance.

E. Source Limitations: Obtain penetration firestopping systems for each kind of penetration and construction indicated, through one source from a single manufacturer.

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Provide penetration firestopping systems that are produced and installed to resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Include both empty openings and openings containing penetrating items. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. 3M Fire Protection Products.
    b. Hilti, Inc.
    c. Nelson Firestopping Products.
    d. Specified Technologies, Inc.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch w.g. (2.49 Pa).

1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
2. F-Rating: Provide penetration firestopping systems with F-ratings indicated, but not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch w.g. (2.49 Pa).

1. Horizontal assemblies include floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
2. F-Rating: Provide penetration firestopping systems with F-ratings of at least one hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: Provide penetration firestopping systems with T-ratings of at least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall. Provide T-rated systems as well as F-ratings where systems protect penetrating items exposed to potential contact with materials in occupiable floor areas in the following locations:

    a. Penetrations located outside wall cavities.
    b. Penetrations located outside fire-resistance rated shaft enclosures.

4. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.

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D. Penetrations in Smoke Barriers, Smoke Partitions, and Smoke Assemblies: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch w.g. (74.7 Pa), shall have L-Ratings as follows:

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at and no more than 50-cfm (0.024-cu. m/s) cumulative total for any 100 sq. ft. (9.3 sq. m) at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping Systems: For penetration firestopping systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant penetration firestopping systems.
2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestopping systems capable of supporting floor loads involved, either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide penetration firestopping systems not requiring removal of insulation.
4. Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.

F. VOC and Emissions Requirements: Paints and coatings, adhesives, and sealants, wet applied on site shall comply with:

1. VOC limits (g/L) found in tables in Division 01 Section "Sustainable Design Requirements."
2. Emissions testing criteria of CHPH Standard v1.2-2017.

G. VOC Content: Penetration firestopping sealants and primers comply with the following limits for VOC Content:

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials, including the following:

    a. Slag-wool-fiber or rock-wool-fiber insulation.
    b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

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I. Sealants: All sealants used in firestopping systems shall comply with ASTM G21 for a 0 rating for mold and mildew resistance.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve made of polypropylene materials lined with an intumescent strips within device and fire rated cloth closures that allow for future reconfiguration of cables and addition of future cabling without the need to demolish, remove or replace firestop, and a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket. Only fully tested and approved cast-in-devices will be considered.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Putty Pads: Moldable non-curing one component, intumescent, fire-rated material for through-penetration fire stop systems and sound attenuation systems; self-adhering; 1/8 inch (3 mm) thick minimum intumescent putty pads for molding around electric boxes and other equipment items embedded in fire rated construction.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

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L. Fire Rated Cable Management Devices: Factory assembled round metallic sleeve device for use with cable penetrations, containing an integrated smoke seal fabric membrane that can be opened and closed for re-penetration.

M. Drop-In Firestop Device: Pre-formed firestop devices for use with noncombustible and combustible pipes (closed and open systems), conduit, or cable bundles penetrating concrete floors.

2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work. Remedy conditions detrimental to the proper and timely completion of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

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3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply performance requirements, and with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

D. Install intumescent putty pads over all electrical and other type of device boxes and other items penetrating fire-rated walls, including but necessarily limited to electrical junction boxes, electrical switch boxes, power outlet receptacle boxes, thermostat control boxes, telephone outlet boxes, exit sign boxes, building clock boxes, and television cable or antenna outlet boxes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label both sides of walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "WARNING - PENETRATION FIRESTOPPING - DO NOT DISTURB. NOTIFY BUILDING MANAGEMENT OF ANY DAMAGE."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

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3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: At the start of the installation, periodically as the Work progresses, and after completion, furnish the services of the firestop material manufacturers' technical representative at the job site as necessary to advise on every phase of the Work. As a minimum, furnish representative's attendance during the first day of installation for each major type of firestop material, and furnish technical assistance to the Installer as may be required.

B. Inspecting Agency: Owner will engage a qualified independent inspection and testing agency to perform tests and inspections according to ASTM E2174 requirements for fire resistive joint systems including those related to qualifications, conducting inspections, preparing test reports.

1. Owner's inspection agency shall monitor the Contractor's Quality Control program. Monitoring activities are at the independent inspection agent's discretion and shall in no way relieve the contractor of sole responsibility for the Work
2. Inspections of firestopping work shall comply with the local jurisdiction's Building Code "Special Inspections" statutory requirements for component materials and installation.
3. The independent inspection agency shall verify that firestopping systems have been constructed in compliance with the submitted designs for fire rating required by the Contract Documents and are acceptable to Authorities having jurisdiction.
4. The firestop installer shall not proceed with installation of joint systems for the next area unit inspecting agency determines work shows compliance with requirements.
5. Inspections shall include:

    a. Visual inspection of substrates before installation of firestopping to ascertain that preparation has been performed in accordance with the Contract Documents.
    b. Visual inspection of completed work including removal of damming materials if used to ensure an adequate and complete fire and smoke seal.
    c. Final inspection after other trades have completed Work in contact with firestopping material, but before firestopping material is covered.

C. The installer shall remove and replace firestop systems where inspections indicate that they do not comply with specified requirements.

D. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

E. The installer may only proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

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3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Where Intertek Group-listed systems are indicated, they refer to design numbers in Intertek Group's "Directory of Listed Building Products" under "Firestop Systems."

C. Where FM Global-approved systems are indicated, they refer to design numbers listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."

D. Firestop System Type **FS-1**: Penetration firestopping systems with no penetrating items through concrete penetrations; as follows:

1. UL-Classified Systems: C-AJ- 0001-0999.
2. F-Rating: As specified for fire-resistance rated walls and horizontal assemblies.
3. T-Rating: As specified for horizontal assemblies.
4. L-Rating: As specified for smoke barriers.
5. W-Rating: No leakage of water at completion of water leakage testing. For horizontal assembly locations as specified.
6. Type of Fill Materials: One or more of the following:

    a. Latex sealant.
    b. Silicone sealant.
    c. Intumescent putty.
    d. Mortar.

E. Firestop System Type **FS-1A:** Penetration firestopping systems for no penetrating items through gypsum board framed walls; as follows:

1. UL Classified Systems: W-L-0001-0999.
2. F-Rating: As specified for fire-resistance-rated walls.
3. L-Rating: As specified for smoke barriers.
4. Type of Fill Materials: One or more of the following:

    a. Latex sealant.
    b. Silicone sealant.
    c. Intumescent putty.

F. Firestop System Type **FS-2**: Penetration firestopping systems for metallic pipes, conduit, or tubing through concrete; as follows:

1. UL-Classified Systems:

    a. Wall/Floor Combination: Floor 5" or less, Walls 8 " or less: C-AJ-1001-1999.
    b. Wall/Floor Combination: Floor over 5", Walls 8" or less: C-BJ-1001-1999.
    c. Wall Penetrations 5" or less: F-A-1001-1999.

2. F-Rating: As specified for fire-resistance-rated walls and horizontal assemblies.
3. T-Rating: As specified for horizontal assemblies.
4. L-Rating: As specified for smoke barriers.
5. W-Rating: No leakage of water at completion of water leakage testing. For horizontal assembly locations as specified
6. Type of Fill Materials: One or more of the following:

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a. Latex sealant.
b. Silicone sealant.
c. Intumescent putty.
d. Firestop device

G. Firestop System Type **FS-2A**: Penetration firestopping systems for metallic pipes, conduit, or tubing through gypsum board framed walls; as follows:

1. UL-Classified Systems: W-L-1001-1999.
2. F-Rating: As specified for fire-resistance-rated walls.
3. L-Rating: As specified for smoke barriers.
4. Type of Fill Materials: One or more of the following:

a. Latex sealant.
b. Silicone sealant.
c. Intumescent putty.
d. Firestop device

H. Firestop System Type **FS-2B**: For Penetration Firestopping Systems for metallic pipe nominal 30-inch diameter, conduit nominal 4-inch diameter, or tubing nominal 6 inch diameter, or metal sleeves 32 inch diameter of Penetrants through reinforced lightweight concrete walls:

1. UL-Classified Systems: W-J-1000-1999.
2. F-Rating: As specified for fire-resistance-rated walls.
3. Type of Fill Materials: One or more of the following:

a. Latex sealant
b. Intumescent wrap strips.
c. Firestop device.
d. Intumescent composite sheet.
e. Firestop blocks/plugs.

I. Firestop System Type **FS-3**: Penetration firestopping systems for nonmetallic pipe, conduit, or tubing; through concrete, as follows:

1. UL-Classified Systems: C-AJ-2001-2999.
2. F-Rating: As specified for fire-resistance-rated walls and horizontal assemblies.
3. T-Rating: As specified for horizontal assemblies.
4. L-Rating: As specified for smoke barriers.
5. W-Rating: No leakage of water at completion of water leakage testing. For horizontal assembly locations as specified
6. Type of Fill Materials: One or more of the following:

a. Latex sealant.
b. Silicone sealant.
c. Intumescent putty.
d. Firestop device.

J. Firestop System Type **FS-3A**: Penetration firestopping systems for nonmetallic pipe, conduit, or tubing through framed gypsum board walls; as follows:

1. UL-Classified Systems: W-L-2001-2999.
2. F-Rating: As specified for fire-resistance-rated walls.
3. L-Rating: As specified for smoke barriers.

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4. Type of Fill Materials: One or more of the following:

    a. Latex sealant.
    b. Silicone sealant.
    c. Intumescent putty.
    d. Intumescent wrap strips.
    e. Firestop device.

K. Firestop System Type **FS-4**: Penetration firestopping systems for electrical cables, through concrete; as follows:

1. UL-Classified Systems: C-AJ-3001-3999.
2. F-Rating: As specified for fire-resistance-rated walls and horizontal assemblies.
3. T-Rating: As specified for horizontal assemblies.
4. L-Rating: As specified for smoke barriers.
5. W-Rating: No leakage of water at completion of water leakage testing. For horizontal assembly locations as specified.
6. Type of Fill Materials: One or more of the following:

    a. Latex sealant.
    b. Silicone sealant.
    c. Intumescent putty.
    d. Silicone foam
    e. Pillows/bags.
    f. Firestop device.
    g. Firestop blocks/plugs.

L. Firestop System Type **FS-4A**: Penetration firestopping systems for electrical cables through framed gypsum walls:

1. UL-Classified Systems: W-L-3001-3999.
2. F-Rating: As specified for fire-resistance-rated walls.
3. L-Rating: As specified for smoke barriers.
4. Type of Fill Materials: One or more of the following:

    a. Latex sealant.
    b. Silicone sealant.
    c. Intumescent putty.
    d. Silicone foam
    e. Pillows/bags.
    f. Firestop device.
    g. Firestop blocks/plugs.

M. Firestop System Type **FS-5**: Penetration firestopping systems for cable trays with electric cables through concrete:

1. UL-Classified Systems: C-AJ-4001-4999.
2. F-Rating: As specified for fire-resistance-rated walls and horizontal assemblies.
3. T-Rating: As specified for horizontal assemblies.
4. L-Rating: As specified for smoke barriers.
5. W-Rating: No leakage of water at completion of water leakage testing. For horizontal assembly locations as specified.
6. Type of Fill Materials: One or more of the following:

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a. Latex sealant.
b. Intumescent putty.
c. Silicone foam.
d. Pillows/bags.
e. Firestop device.
f. Firestop blocks/plugs.

N. Firestop System Type **FS-5A**: Penetration firestopping systems for cable trays with electric cables through framed gypsum board walls:

1. UL-Classified Systems: W-L-4001-4999.
2. F-Rating: As specified for fire-resistance-rated walls.
3. L-Rating: As specified for smoke barriers.
4. Type of Fill Materials: One or more of the following:

a. Latex sealant.
b. Intumescent putty.
c. Silicone foam.
d. Pillows/bags.
e. Firestop device.
f. Firestop blocks/plugs.

O. Firestop System Type **FS-6**: Penetration Firestopping Systems for Insulated Pipes through concrete; as follows:

1. UL-Classified Systems: C-AJ-5001-5999.
2. F-Rating: As specified for fire-resistance-rated walls and horizontal assemblies.
3. T-Rating: As specified for horizontal assemblies.
4. L-Rating: As specified for smoke barriers.
5. W-Rating: No leakage of water at completion of water leakage testing. For horizontal assembly locations as specified
6. Type of Fill Materials: One or more of the following:

a. Latex sealant.
b. Intumescent putty.
c. Silicone foam.
d. Intumescent wrap strips.
e. Firestop device.
f. Firestop blocks/plugs.

P. Firestop System Type **FS-6A**: Penetration firestopping systems for insulated pipes through framed gypsum board walls:

1. UL-Classified Systems: W-L-5001-5999.
2. F-Rating: As specified for fire-resistance-rated walls.
3. L-Rating: As specified for smoke barriers.
4. Type of Fill Materials: One or more of the following:

a. Latex sealant.
b. Intumescent putty.
c. Silicone foam.
d. Intumescent wrap strips.
e. Firestop device.
f. Firestop blocks/plugs.

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Q. Firestop System Type **FS-7**: Penetration Firestopping Systems for Miscellaneous Electrical Penetrants through concrete; as follows:

1. UL-Classified Systems: C-AJ- 6001-6999 for electrical busways.
2. F-Rating: As specified for fire-resistance rated walls and horizontal assemblies.
3. T-Rating: As specified for horizontal assemblies.
4. L-Rating: As specified for smoke barriers.
5. W-Rating: No leakage of water at completion of water leakage testing. For horizontal assembly locations as specified.
6. Type of Fill Materials: One or more of the following:

    a. Latex sealant.
    b. Intumescent putty.
    c. Firestop device
    d. Firestop blocks/plugs.

R. Firestop System Type **FS-7A**: Penetration firestopping systems for miscellaneous electrical penetrants through framed gypsum walls:

1. UL-Classified Systems: W-L- 6001-6999 for electrical busways.
2. F-Rating: As specified for fire-resistance rated walls.
3. L-Rating: As specified for smoke barriers.
4. Type of Fill Materials: One or more of the following:

    a. Latex sealant.
    b. Intumescent putty.
    c. Firestop device
    d. Firestop blocks/plugs.

S. Firestop System Type **FS-8**: Penetration firestopping systems for miscellaneous mechanical penetrants through concrete walls and floors:

1. UL-Classified Systems: C-AJ-7001-7999.
2. F-Rating: As specified for fire-resistance rated walls and horizontal assemblies.
3. T-Rating: As specified for horizontal assemblies.
4. L-Rating: As specified for smoke barriers.
5. W-Rating: No leakage of water at completion of water leakage testing. For horizontal assembly locations as specified.
6. Type of Fill Materials: The following:

    a. Latex sealant.

T. Firestop System Type **FS-8A**: Penetration firestopping systems for miscellaneous mechanical penetrants through framed gypsum board walls:

1. UL-Classified Systems: W-L-7001-7999.
2. F-Rating: As specified for fire-resistance rated walls.
3. L-Rating: As specified for smoke barriers.
4. Type of Fill Materials: The following:

    a. Latex sealant.

U. Firestop System Type **FS-9**: Penetration firestopping systems for groupings of penetrants through concrete:

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1. UL-Classified Systems:

    a. Combination Floors/Walls; with Floors 5" or less and Walls 8" or less

        1) C-AJ-8001-8999 for combinations.
        2) C-AJ-2000-2999 for plastic pipes.
        3) C-AJ-6000-6999 for electric busways.

    b. Floors 5 inch or less F-A-1000-1999 for floors 5 inch or less and metal pipes.

2. F-Rating: As specified for fire-resistance-rated walls and horizontal assemblies.
3. T-Rating: As specified for horizontal assemblies.
4. L-Rating: As specified for smoke barriers.
5. W-Rating: No leakage of water at completion of water leakage testing. For horizontal assembly locations as specified.
6. Type of Fill Materials: One or more of the following:

    a. Latex sealant
    b. Intumescent wrap strips.
    c. Firestop device.
    d. Intumescent composite sheet.
    e. Firestop blocks/plugs.

V. Firestop System Type **FS-9A**: For Penetration Firestopping Systems for Groupings of Penetrants through framed gypsum board walls:

1. UL-Classified Systems: W-L-8001-8999 for combinations.
2. F-Rating: As specified for fire-resistance-rated walls.
3. L-Rating: As specified for smoke barriers.
4. Type of Fill Materials: One or more of the following:

    a. Latex sealant
    b. Intumescent wrap strips.
    c. Firestop device.
    d. Intumescent composite sheet.
    e. Firestop blocks/plugs.

END OF SECTION 078413

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SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Joints in or between fire-resistance-rated constructions.
2. Joints at exterior curtain-wall/floor intersections.
3. Joints in smoke barriers.

C. Related Requirements:

1. Division 03 Section "Cast-In-Place Concrete."
2. Division 04 Section "Unit Masonry."
3. Division 07 Section "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.
4. Division 09 Section "Gypsum Board Assemblies."

1.2 PRE-INSTALLATION CONFERENCE

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Prior to commencing work of this Section, arrange pre-installation conference to be attended by the Owner, Architect, inspecting agency representative, Contractor, Contractor's superintendent, fire resistive joint systems manufacturer, fire resistive joint systems subcontractor and other subcontractors whose work interfaces with fire resistive joint systems.
2. Pre-installation conference agenda shall include but not limited to; fire resistive joint system design ratings, examine procedures for ensuring quality of fire resistive joint systems, inspection of surfaces and substrates to receive fire resistive joint systems indicated in order that alternate recommendations may be made should adverse conditions exist including but not limited to the following:

    a. Fire resistive joint systems design ratings.
    b. Installation clearances
    c. Framing around openings
    d. Minimum spacing of penetrants
    e. Correct opening sizes for penetrant systems to be used
    f. Penetrant materials permitted
    g. Maximum number of penetrants in each opening
    h. Access at both sides of penetrations for installation of fire resistive joint systems

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1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Submit manufacturer's literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work

B. Sustainable Design Submittals

1. Product Data: For insulation products, indicating VOC content.
2. Product Data: For adhesives and sealants wet applied, indicating VOC content.
3. Laboratory Test Reports: For adhesives and sealants wet applied, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For each fire-resistive joint system, provide shop drawings indicating

1. Each kind of construction condition in which joints are installed and relationships to adjoining construction.
2. Fire resistive joint system design listings applicable to each configuration, including illustrations, from a qualified testing and inspecting agency acceptable to authorities having jurisdiction, demonstrating compliance with specified requirements.
3. Furnish shop drawings or full size 8-1/2 in. x 11 in. system drawings to include the information that is typically contained within a UL System Drawing for each condition.
4. Where project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular "fire resistant joint system" firestop condition, submit engineer judgment drawing developed by joint firestop system manufacturer's fire-protection engineer in accordance with the provisions of the International Firestop Council.

D. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspection agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, signed and sealed approved by fire-resistive joint system manufacturer's fire-protection engineer, licensed to practice in the State of the Project, as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

C. Sustainable Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
3. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

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E. Field quality-control test reports: Certified copies of test reports (conclusions and summary only) from approved independent testing laboratories showing compliance with the Contract Documents and including current system number per UL Listing for each type of fire resistive joint system to be utilized on the project

F. Inspection test reports: Submit copies of inspection test reports, prepared by an independent testing agency, for fire stops, fire resistive joint systems and perimeter fire barriers in accordance with report procedures as contained within ASTM E2174 and ASTM E2393 showing inspection results and remedial action taken, if any.

G. Building Department Acceptance: If applicable submit a copy of the Building Department acceptance sheet for each fire resistive joint systems system submitted for each specific condition on Project.

H. Research/Evaluation Reports: For each type of fire-resistive joint system. Evidence of fire-resistive joint systems' compliance with ASTM 1966 and UL 2079.

1.5 QUALITY ASSURANCE

A. Fire Resistive Joint Manufacturer: Do not use fire resistive joint material produced by any manufacturer who will not agree to send a direct employee as a qualified technical representative to the project site, during the initial installation and when requested, for the purpose of training appropriate installer personnel in proper selection and installation procedures and for rendering advice concerning the proper installation of materials. Manufacturer shall employ a professional Fire Protection Engineer licensed to practice in the State of the Project, with qualifications acceptable to the Society of Fire Protection Engineers (SFPE).

B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

C. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

1. The manufacturer of the selected firestopping materials must perform the following:

    a. Annual audits of the installer by the manufacturer, demonstrating their compliance with installation requirements.
    b. Training by a Senior Fire Protection Specialist provided by the manufacturer for installers on this particular project.
    c. Periodic visits to the jobsite to ensure that the installed systems meet the UL requirements and the manufacturer’s requirements for the assembly.

D. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:

1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.

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2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:

    a. Fire-resistive joint system products bear classification marking of qualified testing agency.
    b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:

        1) UL in its "Fire Resistance Directory."
        2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
        3) <Insert name of qualified testing agency>.

E. Fire Resistive Joint Systems: Provide only fire resistive joint systems which have been tested and listed to meet every condition in the Work. Do not provide materials or systems, that are not part of a tested system, suitable for the condition; or not certified by manufacturer as an engineered deviation suitable for the condition as approved by manufacturer's qualified Fire Protection Engineer.

1. Where there is no specific third party tested and classified fire resistive joint system available for a particular configuration, the fire resistive joint systems contractor shall submit an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFFRA) from the manufacturer's qualified a Fire Protection Engineer based on an actual tested assembly. If a tested and rated fire-resistive joint system exists from another from another manufacturer exists for the condition, manufacturer's engineered deviations shall not be permitted.

F. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

1. Comply with Building Code requirement for; "Fire Tests for Through- Penetration Fire Stops", including referenced provisions for ASTM E2307. In addition, provide materials, accessories and application procedures which have been approved for use in the State of the Project.

G. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

H. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

I. Field Samples: Provide a field sample for each type, condition, and application of fire resistive joint systems in the building at final installation locations. Utilize the same materials and installation methods in the sample as required for the final Work. Schedule the installation with allowance for sufficient curing time so that the sample may be examined, and any necessary adjustments made, at least 1 week prior to date scheduled for commencing installation of the Work. When accepted, sample areas shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project and shall remain a part of the final Work.

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1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver and store materials in manufacturer's original packaging labeled to show name, brand, type, and grade. Store materials in protected dry location off ground in accordance with manufacturer's instructions. Do not open packaging nor remove labels until time for installation.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation. . Maintain adequate temperature and ventilation conditions to ensure proper application and curing of fire resistive joint systems.

1.8 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify the Owner's inspecting and testing agency at least seven days in advance of fire-resistive joint system installations. Confirm dates and times on day preceding each series of installations.

1. Do not cover or conceal fire resistive joint system installations behind other construction until after each installation has been examined by the inspecting agency, and building inspector if required by authorities having jurisdiction.

1.9 WARRANTY

A. Special Warranty: Submit five (5) year written warranty signed by the manufacturer and Installer, agreeing to repair or replace Work which has shown any evidence of deterioration, failed to provide an airtight seal, failed to provide a watertight seal where required, failed in adhesion or cohesion, or otherwise failed as a result of defects in materials or workmanship. Upon notification of such defects, within the warranty period, make necessary repairs or replacement at the convenience of the Owner. Other warranties may not be substituted by the Contractor for the terms of this special warranty

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

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a. Joint firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."

B. Low-Emitting Materials:

1. Insulation products on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. Adhesives and Sealants wet-applied on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
3. All adhesives and sealants wet-applied onsite must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4/v4.1 BD+C: New Construction".

2.2 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the fire resistive joint systems indicated for each application that are produced by one of the following manufacturers:

1. Hilti, Inc.
2. Roxul Inc.
3. Johns Manville
4. RectorSeal Corporation (The).
5. Specified Technologies Inc. (STI)
6. 3M; Fire Protection Products Division.
7. Thermafiber, Inc. and Owens Corning Company

2.3 FIRE-RESISTIVE JOINT SYSTEMS

A. General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

1. Fire resistive joint systems indicated on the Drawings are based on design conditions. Contractor's selection of fire resistive joint systems shall be suitable for the field conditions based on the actual size, location and materials of the penetrants.
2. Submit a UL tested and listed assembly sheet identical to each field condition, so that installed fire resistive joints are identical to tested assemblies.
3. For conditions that do not have a UL listed and tested assembly sheet, employ a fire protection engineer capable of submitting an engineering judgment for the review and acceptance of the Owner's independent inspection agency.
4. Provide fire resistive joint materials which are non-toxic, non-hazardous, do not contain asbestos fibers or dust particles nor other substance prohibited by law, and do not require hazardous waste disposal of used containers.
5. For fire resistive joint system assemblies exposed to view, traffic, moisture and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.

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B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with movement capabilities, W and L- ratings determined per ASTM E1966 or UL 2079 under positive pressure differential of not less than 0.01 in. water column and classified with ratings for fire resistance, leakage and movement capability to meet specified requirements:

1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies, and roofs or roof/ceiling assemblies.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. 3M Fire Protection Products.
    b. Hilti, Inc.
    c. Johns Manville; a Berkshire Hathaway company.
    d. RectorSeal.
    e. Specified Technologies, Inc.
    f. Thermafiber, Inc.; an Owens Corning company.

3. Fire Sealant: Provide fire sealant to comply with tested approved tested assemblies. Acceptable manufacturers are:

    a. 3M Fire Protection Products, FireDam Spray 200.
    b. Hilti, Inc.
    c. Johns Manville; a Berkshire Hathaway company.
    d. RectorSeal.
    e. Specified Technologies, Inc., Series AS200 Elastomeric Spray
    f. Thermafiber, Inc.; an Owens Corning company.

C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide perimeter fire-resistive joint systems specifically produced to contain fire between floors, with rating determined by ASTM E285 (ASTM E119), ASTM E2307 and E1996, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa), cycle tested in accordance with ASTM E1399 classified with ratings for integrity, insulation, leakage and movement capability to meet specified requirements. Minimum rating shall be 2 hours.

1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the floor assembly as noted on drawings.
2. Firestopping/Safing: Mineral fibers combined with thermosetting resins; complying with ASTM C612, Class 1 and 2; density 4 pcf ; rated noncombustible when tested in accordance with ASTM E136; manufacturer's standard size; one of the following:

    a. "Thermafiber Safing" (Thermafiber Inc.).
    b. "FBX Safing" (Fibrex, Inc.).
    c. "Perimeter Safing Insulation" (Rock Wool Manufacturing Co).
    d. "Roxul Safe" (Roxul Inc.)
    e. "JM MinWool Safing" (Johns Manville)
    f. Fire Sealant Manufacturers: Provide fire sealant produced to resist the passage of smoke through firestops, and to comply with tested assemblies. Subject to compliance with requirements, provide products by one of the following:
    a. "SpecSeal AS200 Elastomeric Spray" STI
    b. "Fire and Water Barrier Tape" 3M; Fire Protection Products Division.

D. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079.

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1. L-Rating: Not exceeding 5.0 cfm/ft (0.00775 cu. m/s x m) of joint at 0.30 inch wg (74.7 Pa) at both ambient and elevated temperatures.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. 3M Fire Protection Products
    b. Hilti, Inc.
    c. Specified Technologies, Inc

E. Building Movement: Provide fire resistive joint systems suitable to withstand building movements, including thermal movements, loading deflections, shrinkage, creep and similar movements, when tested in accordance with specified standards.

F. Water Resistance: Provide fire resistive joint systems resistant to degradation from moisture during normal service before exposure to heat and fire. Fire resistive joint systems used in the exterior wall, roof, plaza and other locations that penetrate the exterior envelope shall also function as a watertight seal preventing passage of water.

G. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

H. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

I. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and have VOC content in compliance with applicable VOC limits (g/L) found in tables in Division 01 Section "Sustainable Design Requirements.":

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

J. Low-Emitting Materials: Fire-resistive joint system sealants shall meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.

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

1. Sealant: provide joint firestopping system sealants rated with mold and mildew resistance rating of one (1) or less as determined by ASTM G21.

L. Curtain Wall Safing Clips, Mechanically Secured Impaling Pins and Backing\ Reinforcement Members: Galvanized steel safing clips, mechanically secured impaling pins and backing\reinforcement members approved by the manufacturer of curtain wall insulation for holding safing and curtain wall insulation in place and matching components in rated tested assembly.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine substrates of areas to receive the Work and conditions under which the Work will be performed, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work. Remedy conditions detrimental to the proper and timely completion of the Work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.
2. Do not apply fire resistive joint material until the construction defining the opening and installation of all penetrants through the opening has been completed. Verify that pipe, conduit, cable, and other penetrants have been secured.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with performance requirements and the fire resistive joint manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Damming: Provide leakproof damming or containment to seal openings and otherwise prevent flow or displacement of fire resistive joint systems from the spaces to be filled. Provide only non-combustible damming where the damming cannot be removed after application of fire resistive joint systems. Combustible damming may be used temporarily, but only if damming is completely removed as soon as the fire resistive joint systems is cured and self-supporting.

C. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

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1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

D. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

E. Installation of Perimeter Firesafing and Insulation: Install in accordance with manufacturer's written instruction utilizing materials and methods so as to comply with tested rated assembly if required.

1. Retain Insulation in place by metal clips and straps or integral pockets within window frames, spaced at intervals recommended by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width between insulation and glass of dimension indicated.
2. Brace insulation where it contacts fire-safing insulation to prevent insulation from bowing under pressure from fire-safing insulation.
3. Sealant: Apply fire rated sealant/fire rated tape over surface of perimeter firesafing as required to stop the passage of smoke and air from floor to floor.

3.4 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "WARNING - FIRE-RESISTIVE JOINT SYSTEM - DO NOT DISTURB. NOTIFY BUILDING MANAGEMENT OF ANY DAMAGE."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service: At the start of the installation, periodically as the Work progresses, and after completion, furnish the services of the fire resistive joint material manufacturers’ technical representative at the job site as necessary to advise on every phase of the Work. As a minimum, furnish representative’s attendance during the first day of installation for each major type of fire resistive joint material, and furnish technical assistance to the Installer as may be required.

B. Inspecting Agency: Owner will engage a qualified independent testing and inspecting agency to inspect fire resistive joint systems, perform on-site tests and inspections according to

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ASTM E2174 requirements for fire resistive joint systems and according to ASTM E2393 for perimeter fire barriers including those related to qualifications, conducting inspections,, and prepare inspection reports. The inspection agency shall monitor the Subcontractor's Quality Control program and inspection per the requirements of the local Building Code. Inspection activities shall in no way relieve the Subcontractor of sole responsibility for the Work

1. Inspections of the fire resistive joint system work shall comply with local Building Code "Special Inspections" statutory requirements for the requirements of the component materials and installation.
2. Inspecting of completed installations of fire-resistive joint systems shall take place in successive stages as installation of fire-resistive joint systems proceeds. The fire resistive joint systems installer shall not proceed with installation of joint systems for the next area until inspecting agency determines completed work shows compliance with requirements.
3. Inspection and testing agency shall verify that fire resistive joint systems have been constructed in compliance with the submitted designs for fire rating required by the Contract Documents and are acceptable to Authorities having jurisdiction. The inspections company shall:

    a. State in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.
    b. Perform visual inspection of substrates before installation of fire resistive joint systems to ascertain that preparation has been performed in accordance with the Contract Documents.
    c. Perform visual inspection of completed work including removal of damming materials if used to ensure an adequate and complete fire and smoke seal.
    d. Perform final inspection after other trades have completed Work in contact with fire resistive joint systems, but before fire resistive joint systems are covered.

C. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

D. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements

E. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 REPAIR

A. Repair: Repair damaged fire resistive joint systems or remove and replace if damaged beyond successful repair. Comply with manufacturer’s recommendations for repair and replacement.

3.7 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

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END OF SECTION 078446

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SECTION 079100 - PREFORMED JOINT SEALS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the Work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Preformed, foam joint seals.

C. Related Requirements:

1. Division 07 Section "Joint Sealants" for liquid sealants applied over preformed seals in dual seal systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each preformed joint seal product.

B. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:

a. Leadership Extraction Practices:

1) Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
2) Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.

a) Include statement indicating costs for each product having recycled content.

b. Sourcing of Raw Materials: For products that are responsibly sourced within 100 miles of project site, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.

2. Indoor Environmental Quality, Low Emitting Materials:

a. Laboratory Test Reports: For adhesives, sealants, paints, coatings wet applied on site, indicating testing and compliance with the California Department of Public-Health (CDPH) Standard Method V1.2-2017, using the applicable exposure scenario.

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b. For paints, and coatings, wet applied, include printed statement of VOC content, showing compliance with the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure for Architectural Coatings or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016.
c. Adhesives and Sealants wet applied on site: Submit printed statement of showing compliance with the applicable chemical content requirements of SCAQMD Rule 1168, effective July 1, 2005 and rule amendment date of October 6. 2017.
d. Alternative tests for VOC include ASTM D2369-10, ISO 11890, ASTM D6886-03; or ISO 11890-2.
e. Methylene Chloride and perchloroethylene may not be added to paints, coating, adhesive or sealants.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each product exposed to view.

D. Samples for Verification: For each type and color of preformed joint seal required, provide Samples with joint seals in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint seals.

E. Preformed Joint Seal Schedule: Include the following information:

1. Joint seal location and designation.
2. Joint width and movement capability.
3. Joint seal manufacturer and product name.
4. Joint seal color.

1.3 INFORMATIONAL SUBMITTALS

A. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Environmental Product Declarations:

a. Submit product specific type III EPDs or Industry wide (generic) EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Building Product Disclosure and Optimization - Material Ingredients:

a. Material Ingredient Optimization: Submit manufacturer's Environmental Product Declaration (EPD) and at least one of the following:

1) GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
2) Cradle to Cradle: Manufacturer's published literature for the product bearing the Cradle to Cradle logo.
3) International Alternative Compliance Path - REACH Optimization.
4) Declare: Manufacturer's completed Product Declaration Form.
5) Other programs approved by USGBC.

B. Product Test Reports: For each preformed joint seal for tests performed by manufacturer and witnessed by a qualified testing agency.

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C. Warranties: For special warranties.

1.4 QUALITY ASSURANCE

A. Mockups: Install mockups of assemblies specified in other Sections that are indicated to receive preformed joint seals specified in this Section. Use materials and installation methods specified in this Section.

1.5 WARRANTY

A. Special Warranty: Installer agrees to repair or replace preformed joint seals that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish preformed joint seals 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.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.

1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.

B. Coordination: Coordinate installation of exterior wall expansion control systems with parking and open-air structure expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified in Division 07 Sections.

C. Regional Materials: Provide a minimum of 20 percent of building materials (by cost) that are regionally extracted, processed and manufactured materials within a radius of 100 miles.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.

B. VOC and Emissions Requirements: Paints and Coatings, adhesives and sealants, wet applied on site shall comply with:

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1. VOC limits (g/L) found in tables in Division 01 Section "Sustainable Design Requirements."
2. Emissions testing criteria of CHPH Standard v1.2-2017.

C. Field Quality Control:

1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.

2.3 EXTERIOR WALL -PREFORMED, FOAM JOINT SEALS

A. Wall-to-Wall and Wall Corner: (**PJS-xx**) Preformed, Foam Joint Seals : Manufacturer's standard joint seal manufactured from urethane or EVA (ethylene vinyl acetate) foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths based on design criteria indicated, with factory- or field-applied adhesive for bonding to substrates.

B. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following:

1. EMSEAL Joint Systems, Ltd, a division of Sika.
2. Nystrom.
3. Tremco CPG Inc.

C. Basis of Design Product:

1. Sika Corporation “Emshield SecuritySeal SSW2.”
2. Product Characteristics:

   a. Nominal Joint Width: As indicated on Drawings.
   b. Movement Capability: Minus 50 percent/ Plus 50 percent.
   c. Type of Movement: Thermal.
   d. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than that of adjacent construction.

3. Joint Seal Color: Match Architect's sample.

2.4 MISCELLANEOUS MATERIALS

A. Joint Sealants: Provide manufacturer recommended sealants specified in Division 07 Section "Joint Sealants"

B. Primer: Material recommended by preformed-joint-seal manufacturer for joint substrates indicated.

C. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to preformed joint seal manufacturer, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces, and formulated to promote best adhesion to joint substrates.

D. Masking Tape: Nonstaining, nonabsorbent material compatible with preformed joint seals and surfaces adjacent to joints.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive preformed joint seals, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting preformed-joint seal 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 preformed joint seals to comply with preformed joint seal manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of preformed joint seal, including dust, paints (except for permanent protective coatings tested and approved for seal adhesion and compatibility by seal manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimal bond with preformed joint seals. 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.
    d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint seals. 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 by preformed joint seal manufacturer or as indicated by tests or prior experience. Apply primer to comply with joint seal manufacturer's written instructions. Confine primers to areas of joint seal bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of adhesive or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove smears. Remove tape immediately after tooling without disturbing joint seal.

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3.3 INSTALLATION

A. General: Comply with preformed joint seal manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Installation of Preformed, Foam Joint Seals:

1. Install each length of seal immediately after removing protective wrapping.
2. Firmly secure compressed joint seals to joint gap side to obtain full bond using exposed pressure-sensitive adhesive or field-applied adhesive as recommended by manufacturer.
3. Do not pull or stretch material. Produce seal continuity at splices, ends, turns, and intersections of joints.
4. For applications at low ambient temperatures, heat foam joint seal material in compliance with manufacturer's written instructions.

C. Installation of Precured, Extruded-Silicone Joint Seals:

1. Apply masking tape to each side of joint, outside of area to be covered by seal system.
2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone seal system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
3. Press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact with substrate.
4. Complete installation of seal system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

3.4 PROTECTION

A. Protect preformed joint seals from damage resulting from construction operations or other causes so seals are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated seals immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079100

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SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Nonstaining silicone joint sealants.
2. Urethane joint sealants.
3. Mildew-resistant joint sealants.
4. Butyl joint sealants.
5. Latex joint sealants.

C. Related Requirements:

1. Division 07 Section "Preformed Joint Seals" for precured joint seals.
2. Division 07 Section “Acoustical Joint Sealants.”
3. Division 32 Section "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

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B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

1. Joint-sealant location and designation.
2. Manufacturer and product name.
3. Type of substrate material.
4. Proposed test.
5. Number of samples required.

D. Preconstruction Laboratory 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 are needed for adhesion.

E. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

F. Field-Adhesion-Test Reports: For each sealant application tested.

G. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with stone, masonry, and precast architectural concrete substrates.

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4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

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

1.8 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

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

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

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

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

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

1. Sealants wet-applied onsite shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," CDPH standard method version 1.2.

B. Colors of Exposed Joint Sealants: Match Architect's samples.

2.2 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C1248.

B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

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

a. Dow Chemical Company; DowSil 756 SMS Building Sealant.
b. Momentive Performance Materials, Inc.; SCS9000 SilPruf NB.
c. Pecora Corporation; 864 NST.
d. Tremco; Spectrem 3.

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2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

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

a. BASF Construction Chemicals, LLC; Sonolastic TX1.
b. Pecora Corporation; DynaTrol 1XL Hybrid.
c. Tremco; Dymonic 100.

B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

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

a. BASF Construction Chemicals, LLC; Sonolastic SL1.
b. Pecora Corporation; Urexpan NR-201.
c. Tremco; Vulkem 45 SSL.
d.

C. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 50, Uses T and NT.

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

a. LymTal International, Inc.; Iso-Flex 888QC.
b. Pecora Corporation; DynaTrol II.
c. Tremco; Vulkem 445 SSL.

2.4 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

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

a. Dow Chemical Company; DowSil 786 Silicone Sealant.
b. Momentive Performance Materials, Inc.; Sanitary SCS1700.
c. Pecora Corporation; 898 NST.
d. Tremco; Tremsil 200.

2.5 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.

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

    a. Pecora; BA-98.
    b. Tremco; TremPro JS 773.

2.6 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

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

    a. Pecora Corporation; AC-20 +Silicone.
    b. Tremco; TremFlex 834.

2.7 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

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

    a. BASF Construction Chemicals, LLC; MasterSeal 921.
    b. Hohmann & Barnard, Inc.; Standard Backer Rod.
    c. Industrial Thermo Polymers Limited; ITP Soft Type Backer Rod.
    d. Nomaco; HBR.
    e. Nomaco; Sof Rod.
    f. W. R. Meadows; Cera-Rod.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), or Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. 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. Provide self-adhesive tape where applicable.

2.8 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.

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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 performance of the Work.

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, 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.
    d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion 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 by joint-sealant manufacturer or as indicated by 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 or primer 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.

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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 C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

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 in subparagraphs 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 profile per Figure 8A in ASTM C1193 unless otherwise indicated.
4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C1193.
5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

    a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
    b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.

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2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

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

3.5 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.

3.6 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, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS-01.

1. Joint Locations:

    a. Control and expansion joints in brick pavers.
    b. Isolation and contraction joints in cast-in-place concrete slabs.

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c. Joints between plant-precast architectural concrete paving units.
d. Joints in stone paving units, including steps.
e. Tile control and expansion joints.
f. Joints between different materials listed above.
g. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, M, P, 50, T, NT.
3. Joint-Sealant Color: Match Architect's sample.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces JS-02.

1. Joint Locations:

a. Construction joints in cast-in-place concrete.
b. Joints between plant-precast architectural concrete units.
c. Control and expansion joints in unit masonry.
d. Joints in dimension stone cladding.
e. Joints in glass unit masonry assemblies.
f. Joints in exterior insulation and finish systems.
g. Joints between metal panels.
h. Joints between different materials listed above.
i. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
j. Control and expansion joints in ceilings and other overhead surfaces.
k. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
3. Joint-Sealant Color: Match Architect's sample.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-03.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in stone flooring.
c. Control and expansion joints in brick flooring.
d. Control and expansion joints in tile flooring.
e. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, P, 25, T, NT.
3. Joint-Sealant Color: Match Architect's sample.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces JS-04.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Tile control and expansion joints.
c. Vertical joints on exposed surfaces of unit masonry, concrete, walls, and partitions.
d. Joints on underside of plant-precast structural concrete.
e. Other joints as indicated on Drawings.

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2. Joint Sealant: Urethane, S, NS, 25, NT.
3. Joint-Sealant Color: Match Architect's sample.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement JS-05.

1. Joint Locations:

a. Control joints on exposed interior surfaces of exterior walls.
b. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: Match Architect's sample.

F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS-06.

1. Joint Locations:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: Match Architect's sample.

G. Joint-Sealant Application: Concealed mastics JS-07.

1. Joint Locations:

a. Aluminum thresholds.
b. Sill plates.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Butyl-rubber based.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

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SECTION 083323 - OVERHEAD COILING DOORS

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. Insulated service doors.

B. Related Requirements:

1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports and door-opening framing.

1.3 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code.

1.4 COORDINATION

A. General: Coordinate the work of this section with electrical and security system connections, conduit, and wiring requirements shown on the Electrical Drawings and Security Drawings.

1.5 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

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1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic-closing device and testing and resetting instructions.
4. Include manufacturer's specifications, roughing-in diagrams, installation instructions, and electrical rough-in instructions.
5. Include summary of forces and loads on walls and jambs.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Show locations of controls, locking devices, and other accessories.
6. Include diagrams for power, signal, and control wiring.
7. Include similar Samples of accessories involving color selection.

C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Curtain slats.
2. Bottom bar with sensor edge.
3. Guides.
4. Brackets.
5. Hood.
6. Locking device(s).
7. Include similar Samples of accessories involving color selection.

1.6 INFORMATIONAL SUBMITTALS

A. Fabrication Engineering and Design (Delegated Design) Submittal: For overhead coiling doors 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. Summary of forces and loads generated by door system on walls and jambs.

B. Qualification Data: For Installer.

C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Special warranty.

B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

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

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design".

B. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:

1. Design Wind Load: As indicated on Drawings.
2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
3. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.

2.3 DOOR ASSEMBLY

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

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

a. CornellCookson, LLC.
b. McKeon Rolling Steel Door Company, Inc.
c. Overhead Door Corporation.

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B. Operation Cycles: Door components and operators capable of operating for not less than 50,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

C. Air Infiltration: Maximum rate of 1.0 cfm/sq. ft. (5.1 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E283.

D. Curtain R-Value: 5.0 deg F x h x sq. ft./Btu (0.881 K x sq. m/W).

E. Door Curtain Material: Galvanized steel.

F. Door Curtain Slats: Flat profile slats of 2-5/8-inch (67-mm) center-to-center height.

1. Insulated-Slat Interior Facing: Metal.
2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.

G. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from stainless steel or aluminum extrusions and finished to match door.

H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

I. Hood: Match curtain material and finish.

1. Shape: Round.
2. Mounting: Face of wall.

J. Locking Devices: Equip door with locking device assembly and chain lock keeper.

1. Locking Device Assembly: Cremone-type, both jamb sides locking bars, operable from inside and outside with cylinders.

K. Electric Door Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Operator Location: Top of hood.
3. Motor Exposure: Interior.
4. Motor Electrical Characteristics:

    a. Horsepower: 1 hp.
    b. Voltage: 208-V ac, three phase, 60 Hz.

5. Emergency Manual Operation: Chain type.
6. Obstruction-Detection Device: Automatic photoelectric sensor electric sensor edge on bottom bar.

    a. Sensor Edge Bulb Color: Black.

7. Control Station(s): Interior mounted.
8. Other Equipment: Audible and visual signals.

L. Curtain Accessories: Equip door with weatherseals and pole hooks.

M. Door Finish:

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1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
2. Interior Curtain-Slat Facing: Finish as selected by Architect from manufacturer's full range.

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural-steel sheet; complying with ASTM A653/A653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch (0.71 mm); and as required.
2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch (0.25 mm).

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.6 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Galvanized Steel: Nominal 0.028-inch- (0.71-mm-) thick, hot-dip galvanized-steel sheet with G90 (Z275) zinc coating, complying with ASTM A653/A653M.
2. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.

2.7 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

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1. Lock Cylinders: As specified in Section 087100 "Door Hardware".
2. Keys: Three for each cylinder.

C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

1. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene.

B. Pole Hooks: Provide pole hooks and poles for doors more than 84 inches (2130 mm) high.

2.9 COUNTERBALANCE MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

C. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

D. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. 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.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Operator location indicated for each door.

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1. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.

1. Motor Size: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.

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2.11 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

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.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.

D. Power-Operated Doors: Install according to UL 325.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

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3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

1. Adjust exterior doors and components to be weather resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.

3.6 DEMONSTRATION

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

END OF SECTION 083323

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SECTION 083513.43 - MULTIPANEL FOLDING ALUMINUM-FRAMED GLASS DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Multipanel folding aluminum-framed glass doors.

C. Related Requirements:

1. Division 08 Section "Multipanel Sliding Aluminum-Framed Glass Doors" for multipanel aluminum-framed glass doors that operate by sliding.
2. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units on the building exterior.
3. Division 08 Section "Aluminum Windows" for coordinating finishes among aluminum fenestration units on the building exterior.
4. Division 08 Section "Door Hardware" for hardware not specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Multipanel folding aluminum-framed glass doors.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for multipanel folding aluminum-framed glass doors.

C. Sustainable Design Action Submittals:

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:

a. Leadership Extraction Practices:

1) Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
2) Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.

a) Include statement indicating costs for each product having recycled content.

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b. Sourcing of Raw Materials: For products that are responsibly sourced within 100 miles of project site, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.

2. Indoor Environmental Quality, Low Emitting Materials:

a. Laboratory Test Reports: For adhesives, sealants, paints, and coatings wet applied on site, indicating testing and compliance with the California Department of Public-Health (CDPH) Standard Method V1.2-2017, using the applicable exposure scenario.
b. Adhesives and Sealants: For wet applied on-site products, submit printed statement showing compliance with the applicable chemical content requirements of SCAQMD Rule 1168, effective July 1, 2005, and rule amendment date of February 6, 2017.
c. Alternative tests for VOC above include ASTM D2369-10; ISO 11890 part 1; ASTM D6886-03; or ISO 11890-2
d. Methylene Chloride and perchloroethylene may not be added to paints, coating, adhesive or sealants.

D. Shop Drawings:

1. Include plans, elevations, sections, and installation details.
2. Indicate dimensions, configuration of panels, and stacking layout.

E. Samples: For each multipanel folding aluminum-framed glass door and for each color specified, 12-inch-long (300-mm-long) section with factory-applied color finish.

F. Samples for Initial Selection: For doors and hardware with factory-applied color finish.

G. Samples for Verification: For multipanel folding aluminum-framed glass doors and components required, prepared on Samples of size indicated below:

1. Main Framing Member: 12-inch-long (300-mm-long) section with weather stripping, glazing bead and factory-applied color finish.
2. Hardware: Full-size units with factory-applied finish.

H. Product Schedule: For multipanel folding aluminum-framed glass doors.[**Use same designations indicated on Drawings.**]

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For [**Installer**] [**manufacturer**] [**and**] [**testing agency**].

B. Informational Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Environmental Product Declarations:

a. Submit product specific type III EPDs or Industry wide (generic) EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

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2. Building Product Disclosure and Optimization - Material Ingredients:

    a. Material Ingredient Optimization: Submit at least one of the following:

        1) GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
        2) Cradle to Cradle: Manufacturer's published literature for the product bearing the Cradle to Cradle logo, with gold or platinum certification.
        3) International Alternative Compliance Path - REACH Optimization.
        4) Declare: Manufacturer's completed Product Declaration Form.
        5) Other programs approved by USGBC.

C. Product Test Reports: For each multipanel folding aluminum-framed glass door, for tests performed by [**manufacturer and witnessed by a qualified testing agency**] [**a qualified testing agency**]; and for each class and performance grade indicated, tested at AAMA gateway size.

D. Field quality-control reports.

E. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data:

1. For multipanel folding aluminum-framed glass doors to include in maintenance manuals. Include finishes, weather stripping, operable panels, and operating hardware.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating multipanel folding aluminum-framed glass doors that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

B. Installer Qualifications: An installer acceptable to multipanel folding aluminum-framed glass door manufacturer for installation of units required for this Project.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup for multipanel folding aluminum-framed glass doors, as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace multipanel folding aluminum-framed glass doors that fail(s) in materials or workmanship within specified warranty period.

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1. Failures include, but are not limited to, the following:

    a. Failure to meet performance requirements.
    b. Structural failures, including excess deflection.
    c. Excessive water leakage or air infiltration.
    d. Faulty operation of movable panels and hardware.
    e. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    f. Failure of insulating glass[**and laminated glass**].

2. Warranty Period:

    a. Multipanel Folding Aluminum-Framed Glass Doors: [**Five**] [**10**] [**20**] <**Insert number**> year(s) from date of Substantial Completion.
    b. Insulating-Glass Units: [**10**] [**20**] <**Insert number**> years from date of Substantial Completion.
    c. Laminated Glass: [**Five**] <**Insert number**> years from date of Substantial Completion.
    d. Aluminum Finish: [**Five**] [**10**] [**20**] <**Insert number**> years from date of Substantial Completion.

B. Special Finish Warranty, Factory-Applied Finishes: 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 Delta E units when tested in accordance with ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: [**Five**] [**10**] [**20**] <**Insert number**> years from date of Substantial Completion.

C. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    c. Cracking, peeling, or chipping.

2. Warranty Period: [**Five**] [**10**] <**Insert number**> years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Product Certification: AAMA certified with label attached to each door.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class: [**Class R**] [**Class LC**] [**Class CW**] [**Class AW**] [**As indicated on Drawings**] <**Insert class**>.
2. Minimum Performance Grade: [**Grade 15**] [**Grade 20**] [**Grade 25**] [**Grade 30**] [**Grade 35**] [**Grade 40**] [**Grade 45**] [**Grade 50**] [**As indicated on Drawings**] <**Insert grade**>.

C. Thermal Transmittance: NFRC 100 maximum total fenestration product U-factor of [**0.30 Btu/sq. ft. x h x deg F (1.71 W/sq. m x K)**] [**0.32 Btu/sq. ft. x h x deg F (1.83 W/sq. m x K)**] [**0.35 Btu/sq. ft. x h x deg F (2.0 W/sq. m x K)**] [**0.60 Btu/sq. ft. x h x deg F (3.43 W/sq. m x K)**] <**Insert value**>.

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum total fenestration product SHGC of [**0.40**] [**0.30**] [**0.27**] <**Insert value**>.

E. Condensation-Resistance Factor (CRF): Provide multipanel folding aluminum-framed glass doors tested for thermal performance in accordance with AAMA 1503, showing a CRF of [**45**] [**52**] <**Insert value**>.

F. Thermal Movements: Provide multipanel folding aluminum-framed glass doors, including anchorage, 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 joint sealants, 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 (67 deg C), ambient; 180 deg F (100 deg C)**] <**Insert temperature range**>, material surfaces.

G. Sound Transmission Class (STC): Rated for not less than [**28**] [**32**] <**Insert rating**> STC when tested for laboratory sound transmission loss in accordance with ASTM E90 and determined by ASTM E413.

H. Outside-Inside Transmission Class (OITC): Rated for not less than [**23**] [**27**] [**29**] <**Insert rating**> OITC when tested for laboratory sound transmission loss in accordance with ASTM E90 and determined by ASTM E1332.

I. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone [**1**] [**2**] [**3**] [**4**] for [**basic**] [**enhanced**] protection.

1. Large-Missile Test: For glazing located within 30 feet (9.1 m) <**Insert height**> of grade.
2. Small-Missile Test: For glazing located between 30 feet (9.1 m) and [**60 feet (18.3 m)**] <**Insert height**> above grade.

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2.2 MULTIPANEL FOLDING ALUMINUM-FRAMED GLASS DOORS

A. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following:

1. dormakaba Group.
2. Nana Wall Systems, Inc.
3. Panda Windows and Doors.

B. Multipanel Folding Aluminum-Framed Glass Doors: Provide extruded-aluminum-framed multipanel folding glass doors, complete with glazing, threshold, flashings, support, and anchorage devices.

1. Application: [**Exterior**] [**Interior**], [**inward opening**] [**outward opening**].
2. Stack Storage Configuration: [**Panels open from center to both sides**] [**As shown on Drawings**] <**Insert configuration**>.[**Hinge panels together in separate pairs.**]

C. Frames and Door Panels: Fabricated from aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440. Provide factory-assembled door panels that are reglazable without dismantling panel framing, and [**factory-assembled**] [**or**] [**field-assembled**] frames.

1. Thermally Improved Construction: Fabricate frames and door panels with an integral, concealed, low-conductance thermal barrier located between exterior and interior surfaces in a manner that eliminates direct metal-to-metal contact.
2. Door Panel Design: [**As indicated**] [**Narrow stile**] [**Medium stile**] [**Wide stile**] <**Insert dimensions**> design[**, with 10-inch (254-mm) nominal height bottom rail**].
3. Grilles (False Muntins): Provide between-glass grilles in designs indicated to each panel lite, with material and finish to match adjacent door panel finish.
    a. Bar Width: Not less than [**3/4 inch (19 mm)**] [**7/8 inch (22 mm)**] [**1-1/8 inches (28 mm)**] <**Insert dimension**> wide.
    b. Bar Profile: [**Beveled**] [**Ovolo**] [**Square**].

2.3 GLAZING

A. Glass and Glazing: Manufacturer's standard glazing system that produces weathertight seal. [**Comply with requirements for windborne-debris resistance**] [**Comply with requirements indicated in Section 088000 "Glazing"**] <**Insert glazing requirements**>.

1. Glass: ASTM C1036, Type 1, q3; Category II safety glass complying with testing requirements in 16 CFR 1201.
2. Safety Glazing Labeling: Permanently mark safety glazing with certification label of [**the SGCC**] [**the SGCC or another certification agency acceptable to authorities having jurisdiction**] [**or**] [**the manufacturer**]. Label must indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
3. Tint: [**Clear**] [**Gray**] [**Bronze**] [**Green**] <**Insert tint**>.
4. Insulating-Glass Units: ASTM E2190[**, certified through IGCC as complying with requirements of IGCC**].
    a. Filling: Fill space between glass lites with [**air**] [**argon**].
    b. Lites: [**Two**] [**Three**].
    c. Low-E Coating: [**Manufacturer's standard**] [**Pyrolytic on second surface**] [**Sputtered on second surface**] [**Sputtered on third surface**] [**Sputtered on second or third surface**] <**Insert coating**>.

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2.4 HARDWARE

A. Provide manufacturer's standard hardware, fabricated from a corrosion-resistant material compatible with door panels and other components, and complying with AAMA 907. Provide hardware designed to smoothly operate, tightly close, and securely lock multipanel folding aluminum-framed glass doors. Size hardware to accommodate panel weights and dimensions. Provide full-perimeter weatherstripping for each door panel.

B. Panel Support System: Provide panel support system designed for size, weight, and performance requirements of multipanel folding aluminum-framed glass doors indicated. Provide carriers with sealed ball bearings.

1. Overhead Supported: Provide multiwheeled overhead carriers suspended from steel or aluminum track, with lower guide system engaged in threshold for smooth operation. Limit track deflection to no more than [**0.10 inch (2.54 mm)**] <**Insert dimension**> between supports when fully loaded.
2. Bottom Supported: Provide carrier system designed to roll on track within threshold, with overhead wheeled guide that engages upper track.
3. Adjustment: Provide panel support system capable of being adjusted for smooth operation and clearances without needing to remove panels from tracks.
4. Threshold Configuration: Extruded-aluminum [**, thermally broken,**] threshold with [**raised, weather-resistant profile**] [**low profile, compliant with United States Access Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines"**] [**recessed flush profile**] [**with concealed drainage system**].

    a. Aluminum Finish: [**To match panel**] [**Clear anodized**] [**Dark bronze anodized**].

C. Panel Hinges: Stainless steel, multileaf hinge with painted finish to match exterior. Provide integral hangers and guides for hinges that engage panel support system.

D. Locking System:

1. Primary Entrance Panel: Provide manufacturer's standard keyed multipoint locking device, with lever handles on the interior and exterior that operate dead bolt and concealed top and bottom rods.
2. Secondary Entrance Panel: Provide [**dummy trim on interior and exterior with concealed automatic flush bolts**] [**two-point locking device that operates concealed top and bottom rods**] [**surface-mounted flush bolt**] <**Insert locking type**>.
3. Panel Pairs: Provide manufacturer's [**standard handles**] [**removable custodial handles**] and [**two-point locking device that operates concealed top and bottom rods**] [**surface-mounted flush bolt**] at each panel pair.
4. Trim Design: [**As selected from manufacturer's full range**] <**Insert design**>.

    a. Finish: [**As selected from manufacturer's full range of finishes**] [**Polished brass**] [**Antique brass**] [**Satin chrome**] [**Oil-rubbed bronze**] [**Dark bronze**] [**Painted white**] <**Insert finish**>.

5. Cylinders: [**Manufacturer's standard.**] [**ANSI/BHMA A156.5, Grade 1.**] [**As specified in Section 087100 "Door Hardware."**] [**As specified in Section 087111 "Door Hardware (Descriptive Specification)."**]

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2.5 ACCESSORIES

A. Trim: Provide interior and exterior casings, jamb extensions, and other components in material and finish to match door frames.

B. Fasteners: Noncorrosive and compatible with door members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

C. Anchors, Clips, and Accessories: Provide anchors, clips, and accessories of aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron for multipanel folding aluminum-framed glass doors, complying with ASTM B456 or ASTM B633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

1. Windborne-Debris Resistance: Provide anchors of same design used in windborne-debris resistance testing.

2.6 INSECT SCREENS

A. Screen Fabric: Provide screen mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration; and complying with ASTM D3656/D3656M.

1. Fabric Color: [**Manufacturer's standard**] [**Charcoal gray**] [**Silver gray**] <**Insert color**>.

B. Pleated Insect Screen: Screen suspended from the top, with bottom guide, and finish [**to match exterior door face**] [**as selected from manufactures' standard colors**]. Provide single- or two-function operation with screen meeting rails at same location as primary entrance of door.

C. Coiling Insect Screen: Coiling screen housed in jamb-mounted cartridge, guided by upper and lower tracks. Finish [**to match exterior door face**] [**as selected from manufactures' standard colors**]. Provide single- or two-function operation with screen meeting rails at same location as primary entrance of door.

2.7 FABRICATION

A. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

B. Factory-Glazed Fabrication: Glaze sliding aluminum-framed glass doors in the factory.

2.8 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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2.9 ALUMINUM FINISHES

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

B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: [**Light bronze**] [**Medium bronze**] [**Dark bronze**] [**Champagne**] [**Black**] [**Match Architect's sample**] [**As selected by Architect from full range of industry colors and color densities**] <**Insert color**>.

C. Baked-Enamel or Powder-Coat Finish: AAMA 2603, except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <**Insert color and gloss**>.

D. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with [**AAMA 2604**] [**AAMA 2605**] and containing not less than [**50**] [**70**] percent PVDF resin by weight in color coat.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions [**for seacoast and severe environments**].
2. Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <**Insert color and gloss**>.

E. Superior-Performance Organic Finish, Three-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions [**for seacoast and severe environments**].
2. Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <**Insert color and gloss**>.

F. Superior-Performance Organic Finish, Four-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions [**for seacoast and severe environments**].
2. Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <**Insert color and gloss**>.

G. Superior-Performance Organic Finish, Single-Coat FEVE: Fluoropolymer finish complying with AAMA 2605.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

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2. Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <**Insert color and gloss**>.

H. Superior-Performance Organic Finish, Two-Coat FEVE: Fluoropolymer finish complying with AAMA 2605.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.
2. Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <**Insert color and gloss**>.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of Work.

B. Verify rough opening dimensions, levelness of threshold substrate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight hinged-door installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing multipanel folding aluminum-framed glass doors, hardware, accessories, and other components.

B. Windborne-Debris Resistance: Anchor multipanel folding aluminum-framed glass doors that have been tested for windborne-debris resistance to structure, using anchoring method, fastener type, and fastening frequency identical to that used in windborne-debris resistance testing.

C. Install multipanel folding aluminum-framed glass doors level, plumb, square, true to line; without distortion, warp, or rack of frames and panels, and without impeding thermal movement; anchored securely in place to structural support; and in proper relation to wall flashing, vapor retarders, air barriers, water/weather barriers, and other adjacent construction.

D. Set threshold members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

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3.3 FIELD QUALITY CONTROL

A. Testing Agency: [**Owner will engage**] [**Engage**] a qualified testing agency to perform tests and inspections.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing Services: Test and inspect installed multipanel folding aluminum-framed glass doors as follows:

1. Testing Methodology: Test multipanel folding aluminum-framed glass doors for air infiltration and water resistance in accordance with AAMA 502.
2. Air-Infiltration Testing:

    a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
    b. Allowable Air-Leakage Rate: [**1.5**] <**Insert number**> times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.

3. Water-Resistance Testing:

    a. Test Pressure: [**Two-thirds**] <**Insert number**> times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
    b. Allowable Water Infiltration: No water penetration.

4. Testing Extent: [**Three**] [**Three mockup**] <**Insert number or description**> multipanel folding aluminum-framed glass doors of each type as selected by Architect and a qualified independent testing and inspecting agency. Conduct tests after perimeter sealants have cured.
5. Test Reports: Prepared in accordance with AAMA 502.

C. Multipanel folding aluminum-framed glass door will be considered defective if it does not pass tests and inspections.

3.4 ADJUSTING

A. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.

B. Adjust hardware and operable panels to function smoothly, and lubricate as recommended by manufacturer.

3.5 CLEANING

A. Clean exposed surfaces immediately after installation. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, excess sealants, glazing materials, dirt, and other substances.

B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

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3.6 PROTECTION

A. Protect multipanel folding aluminum-framed glass door surfaces from contact with contaminating substances resulting from construction operations. Remove contaminants immediately according to manufacturer's written instructions.

B. Refinish or replace folding aluminum-framed glass doors with damaged finishes.

END OF SECTION 083513.13

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SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Aluminum-framed storefront systems.
2. Aluminum-framed entrance door systems.

C. Related Requirements:

1. Division 08 Section “Sliding Automatic Entrances.”
2. Division 08 Section “Glazed Curtain Walls” for other aluminum glazing systems.
3. Division 08 Section “Door Hardware” for additional door hardware items.
4. Division 08 Section "Glazing" for glass requirements.

1.2 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."

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Describe components within assembly, anchorage and fasteners, glass, door hardware and internal drainage details.
2. Product Data: For sealants, indicating VOC content.

B. Shop Drawings:

1. Include plans, elevations, sections, system dimensions, framed opening requirements, and full-size details, and attachments to other work.
2. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
3. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.

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c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

4. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
5. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations

a. Entrance Door Hardware Schedule: Prepared by or under 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.
b. Include point-to-point wiring diagrams showing the following:

1) Power requirements for each electrically operated door hardware.
2) Location and types of switches, signal device, conduit sizes, and number and size of wires.

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 assemblies, made from 12-inch (300-mm) 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. Fabrication Engineering and Design (Delegated Design): For aluminum-framed entrances and storefronts, submit comprehensive engineering analysis for aluminum framed systems, including analysis data signed and sealed by the qualified professional engineer licensed to practice in the State of Florida, responsible for their preparation, indicating compliance with performance requirements specified. Submission shall include:

1. Analysis for applicable loads on framing members
2. Analysis for applicable loads on anchors and support system for the project.
3. Structural calculations and details of anchoring system, including type, size, and spacing of fasteners.

1.5 INFORMATIONAL SUBMITTALS

A. Preconstruction Laboratory Mockup Testing Submittals:

1. Testing Program: Developed specifically for Project.
2. Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.

B. Qualification Data: For Installer and field testing agency.

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C. Sustainable Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Data: For recycled content of product, separately identifying the percentage of pre-consumer (post-industrial) recycled content and percentage of post-consumer recycled content.
3. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
4. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

D. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

E. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.

F. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C1401. Include periodic quality-control reports.

G. Source quality-control reports.

H. Field quality-control reports.

I. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Provide aluminum storefront, entrances and associated items by a firm having undivided responsibility for the entire storefront, entrance, and glazing installation, except as otherwise specified herein.

1. The Storefront and Entrance Manufacturer's Representatives is required to inspect the storefront and entrance door installation to ensure conformance with this Section and to ensure warrantability of the storefront, doors, hardware, paint finish and their installation
2. Engineering Responsibility: Manufacturer shall have inhouse engineering to 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.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project, with not less than five (5) consecutive years of experience installing storefront and entrances similar that required for the project.

C. Testing Agency Qualifications: Qualified according to ASTM E699 for testing indicated.

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D. 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. 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 change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

E. Structural-Sealant Glazing: Comply with ASTM C1401 for design and installation of storefront systems.

1.8 MOCKUPS

A. 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 wall area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 FIELD 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. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts 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: Five years from date of Substantial Completion.

B. Special Finish Warranty, Factory-Applied Finishes: 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.

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1. Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
    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. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fabrication Engineering and Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements. Provide a comprehensive engineering analysis based on performance requirements and design criteria indicated.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, 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.

C. Building Code Requirements: Provide glazing assemblies and components which comply with requirements of the Florida Building Code.

D. Exterior products in this section must have Florida Product Approval.

E. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

F. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or

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an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

G. Structural: Test according to ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or 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.

H. Air Infiltration: Test according to ASTM E283 for infiltration as follows:

1. Fixed Framing and Glass Area:

a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).

2. Entrance Doors:

a. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

I. Water Penetration under Static Pressure: Test according to ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (720 Pa).

J. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (720 Pa).
2. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

K. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Condensation Resistance: Fixed glazing and framing areas as a system shall have an NFRC-certified condensation resistance rating of no less than 55 as determined according to NFRC 500.

L. Noise Reduction: Test according to ASTM E90, with ratings determined by ASTM E1332, as follows.

1. Outdoor-Indoor Transmission Class: Minimum 26.

M. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

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1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

    a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
    b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
    c. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

2.3 STOREFRONT SYSTEMS

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

1. YKK AP America Inc. “YKK YES 45 TU (Center Set) – FPA No: FL 12926.4.

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally broken.
2. Interior Vestibule Framing Construction: Nonthermal.
3. Glazing System: Retained mechanically with gaskets on four sides.
4. Glazing Plane: Center set.
5. Finish: Superior-Performance Organic Finish, Two-Coat PVDF.
6. Fabrication Method: Field-fabricated stick system.
7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
8. Steel Reinforcement: As required by manufacturer.

C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

2.4 ENTRANCE DOOR SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. YKK AP America Inc. “YKK Entrances 35D” – FLA No: FL 12892.3-R9.

B. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.

1. Door Construction: 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-) 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.
2. Door Design: Medium stile; 3-1/2-inch (89-mm) nominal width; with 3-1/2 inch top and 10 inch bottom rail.
3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

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a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Division 08 Section "Door Hardware."

B. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D2000 molded neoprene or ASTM D2287 molded PVC.

2.6 GLAZING

A. Glazing: Comply with Division 08 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. Sealant shall have a VOC content of 250 g/L or less.

D. Weatherseal Sealants: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.

1. Color: Match structural sealant.

2.7 MATERIALS

A. Sheet and Plate: ASTM B209 (ASTM B209M).

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).

C. Extruded Structural Pipe and Tubes: ASTM B429/B429M.

D. Structural Profiles: ASTM B308/B308M.

E. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
4. Primer: 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.

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2.8 ACCESSORIES

A. Automatic Door Operators: Division 08 Section "Automatic Door Operators."

B. 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.

C. 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 A123/A123M or ASTM A153/A153M requirements.

D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

E. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

F. Rigid PVC Filler.

2.9 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. 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.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using shear-block system.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At interior and exterior doors, provide compression weather stripping at fixed stops.

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G. 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.

H. 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.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

A. Superior-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish system consisting of corrosion inhibitive primer, fluoropolymer color coat and clear fluorocarbon topcoat, complying with AAMA 2605 and AA-C12C42R1x, containing not less than 70 percent PVDF resin by weight in color coat, in not less than 1.2 mils dry film thickness.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.
2. Color and Gloss: Custom color; match Architect's control Sample.

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 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 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. Seal perimeter and other joints watertight unless otherwise indicated.

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B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 088000 "Glazing."

F. 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.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts 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 (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 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 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

    a. Perform a minimum of two tests in areas as directed by Architect.

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2. Air Infiltration: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

    a. Perform a minimum of two tests in areas as directed by Architect.

3. Water Penetration: ASTM E1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. (300 Pa), and shall not evidence water penetration.

C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.

1. Test a minimum of two areas on each building facade.
2. Repair installation areas damaged by testing.

D. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. 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 entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION 084113

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SECTION 084413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Glazed aluminum curtain wall systems.

    a. Conventionally glazed.
    b. Glazing that is physically and thermally isolated from framing members.
    c. Spandrel panel facing materials including transparent glass panels, insulation, and back pans.
    d. Related trim such as sill extenders, interior and exterior mullion covers.
    e. Transition closure panels between the curtain walls in different vertical planes.
    f. Installation of sun control accessories integrated into curtain wall system.
    g. Shop applied coating finishes on curtain wall.
    h. Integration of adjacent enclosure materials and components to create an air and watertight exterior enclosure system.
    i. Firesafing insulation, including supporting clips, between curtain wall and edges of floor slab construction to maintain and continue the fire resistance rating of floor slabs.
    j. Vents and weeps, weep tubes, bellows, closures, gutters, end dams, flashings, trim and cutouts as shown or as may be required in conjunction with the system or to join the system to adjacent construction.
    k. Fasteners, anchors, shims, fasteners, inserts, expansion devices, accessories, support brackets, support struts and attachments
    l. Construction of performance mock-up(s) of size as may be approved by the Architect, including coordination of test chamber construction.
    m. Construction of Visual Mockups.
    n. Coordination of testing of mockup(s) with independent testing laboratory engaged by the Owner, including all coordination of testing and testing procedures.
    o. On-site testing for water leakage.

C. Related Requirements:

1. Division 07 Section "Joint Firestopping" perimeter fire-containment systems (safing insulation) field installed with glazed aluminum curtain walls.
2. Division 07 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 08 Section “Sun Control Accessories.”
4. Division 08 Section "Glazing" for curtain wall glazing.

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

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Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.to comply with requirements of Division 01 Section "Project Management and Coordination." Review methods and procedures related to glazed curtain wall systems including but not limited to the following:

1. Inspect and discuss condition of substrate, and other preparatory work performed by other trades.
2. Review structural loading limitations.
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. Review required inspecting, testing, and certifying procedures.
5. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Sustainable Design Submittals:

1. Laboratory Test Reports: For interior sealants wet applied, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For glazed aluminum curtain walls, stamped by a professional engineer licensed to practice in the State of Florida who is responsible for their preparation and who has performed the structural analysis to show compliance with performance requirements. 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.

a. Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

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b. Show details for coping attachment.

2. Include full-size isometric details of each type of vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:

a. Metal panels
b. Copings.
c. Joinery, including concealed welds.
d. Anchorage.
e. Expansion provisions.
f. Glazing.
g. Flashing and drainage.

3. Distinguish among factory-, shop-, and field-assembled work.
4. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:

1. Joining of typical curtain wall components at framing intersections and corners.
2. Joinery, including concealed welds.
3. Anchorage.
4. Expansion provisions.
5. Glazing.
6. Flashing and drainage.

F. Fabrication Engineering and Design (Delegated Design) Submittal: For glazed aluminum curtain walls, coping and metal panel system submit comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for their preparation, indicating compliance with performance requirements specified. Submission shall include:

1. Analysis for applicable loads on framing members.
2. Analysis for applicable loads on anchors and support system for the project.
3. Structural calculations and details of anchoring system, including type, size, and spacing of fasteners.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For qualified Installer, laboratory mockup testing agency and field testing agency.
2. For professional engineer's experience with providing fabrication engineering and design services of the kind indicated, including documentation that engineer is licensed in the State of Florida.

B. Sustainable Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).

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2. Product Data: For recycled content of product, separately identifying the percentage of pre-consumer (post-industrial) recycled content and percentage of post-consumer recycled content.
3. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
4. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

C. Welding Certificates.

D. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.

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 evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, for tests performed by a qualified testing agency, indicting compliance with performance requirements.

1. Provide lab testing data results (performed within 4 years prior to the date of submission) providing structural, air, and water penetrating testing data for each wall system specified.

G. Quality-Control Program: Developed specifically for Project, including fabrication and installation, in accordance with recommendations in ASTM C1401. Include periodic quality-control reports.

H. Source Quality Control Reports.

I. Field Quality-Control reports.

J. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with 10 years successful experience on projects of comparable size and scope, with in house engineering capability to design, engineer, and fabricate curtain wall systems specified for this project to meet or exceed energy performance requirements specified, and capable of documenting this performance by certification, labeling, and inclusion in lists, who have the in house capability to produce the necessary shop drawings, conduct thermal and energy modeling and provide a comprehensive engineering analysis.

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B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project. Installers and supervisors shall be trained by the manufacturer.

C. Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025 and acceptable to Owner and Architect.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Florida and who is experienced in providing comprehensive engineering services to show that glazed curtain walls designed for the project comply with performance requirements.

E. 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. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval, and only to the extent needed to comply with performance requirements. If changes are proposed, submit comprehensive explanatory data to Architect for review.

F. 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."

G. Energy Performance Standards: Comply with NFRC for minimum standards of energy performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

H. Mockups: Prior to installing exterior wall systems, construct mockup of glazed curtain wall to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution.

1. Provide materials in this section to create the composite mockup indicated.
2. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
3. Build mockup of typical wall area as shown on Drawings by full thickness, including supports, attachments, and accessories.

    a. Include four-way joint.
    b. Actual glass coatings and material finishes shall be provided in mockups for color selection and verification.
    c. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
    d. Demonstrate the proposed range of aesthetic effects and workmanship.
    e. Obtain Architect's approval of mockups before start of Work.

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4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and show recorded measurements on Shop Drawings. Provide actual locations of structural supports for glazed curtain walls. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver curtain wall components, and other manufactured items so as not to be damaged or deformed. Package wall panels for protection during transportation and handling.

B. Unload, store, and erect curtain wall and metal panel system in a manner to prevent bending, warping, twisting, and surface damage.

C. Store wall panels vertically, covered with suitable weathertight and ventilated covering. Store wall panels to ensure dryness, with positive slope for drainage of water. Do not store wall panels in contact with other materials that might cause staining, denting, or other surface damage. Do not allow storage space to exceed 120 degrees F.

D. Retain strippable protective covering for period of construction until final acceptance.

1.10 WARRANTY

A. Special Assembly Warranty: Manufacturer and Installer agree to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranted components include items noted in the “Summary” article above.
2. 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. Thermal stresses transferred to building structure.
    d. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
    e. Failure of system to meet performance requirements.
    f. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    g. Water penetration through fixed glazing and framing areas.
    h. Failure of operating components.
    i. Loosening or weakening of fasteners, attachments, and other components.
    j. Glazing breakage.
    k. Sealant failure.

3. Warranty Period: Ten years from date of Substantial Completion.

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B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
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 PERFORMANCE REQUIREMENTS

A. Fabrication Engineering and Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to provide fabrication engineering and design of glazed aluminum curtain walls, including metal panels, copings, supports, air/water barrier, insulation to comply with performance requirements specified. Provide a comprehensive engineering analysis by a qualified professional engineer licensed to practice in the State of Florida and responsible for preparation of fabrication engineering, using performance requirements and criteria specified.

B. Low-Emitting Materials:

1. Interior sealants wet-applied onsite must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.

C. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls, metal panels and copings 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. Deflection exceeding specified limits.
b. Framing members transferring stresses, including those caused by thermal and structural movements to glazing and/or metal panels.
c. Thermal stresses transferring to building structure.
d. Glass breakage.
e. Glazing-to-glazing contact.
f. Noise or vibration created by wind and thermal and structural movements.
g. Loosening or weakening of fasteners, attachments, and other components.
h. Failure of operating units.

D. Structural Loads:

1. Wind Loads: As indicated on Drawings.

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a. Wind pressures used in the Project design are shown on the Structural Drawings.

2. Other Design Loads: As indicated on Drawings.

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 of 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 of greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm).

a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.

3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:

a. Perpendicular to Plane of Wall: Deflection of cantilevered framing members shall not exceed 2L/175 or 3/4-inch maximum, whichever is less.

F. Structural: Test in accordance with ASTM E330/E330M 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, or 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.

G. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (720 Pa).

H. Water Penetration under Dynamic Pressure: Test in accordance with AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (720 Pa).
2. Maximum Water Leakage: In accordance with AAMA 501.1. 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 or water that is drained to exterior.

I. Interstory Drift: Accommodate design displacement of adjacent stories indicated.

1. Design Displacement: As indicated on Drawings.
2. Test Performance: Complying with criteria for passing based on building occupancy type when tested in accordance with AAMA 501.4 at design displacement and 1.5 times the design displacement.

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J. Energy Performance: Certified and labelled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor):

a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.36 Btu/sq. ft. x h x deg F (2.04 W/sq. m x K) as determined in accordance with NFRC 100.

2. Solar Heat Gain Coefficient (SHGC):

a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.25 as determined in accordance with NFRC 200.

3. Air Leakage:

a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa) when tested in accordance with ASTM E283.

4. Condensation Resistance Factor (CRF):

a. Fixed Glazing and Framing Areas: CRF for the system of not less than 55 as determined in accordance with AAMA 1503.

K. Noise Reduction: Test in accordance with ASTM E90, with ratings determined by ASTM E1332, as follows:

1. Outdoor-Indoor Transmission Class: TBD.
2. Sound Transmission Class: TBD.

L. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C), material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested in accordance with AAMA 501.5.

a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 degrees F (82 degrees C).
b. Low Exterior Ambient-Air Temperature: 0 degrees F (minus 18 degrees C).

M. Fire, Smoke and Draft Barrier: Provide a continuous fire/smoke/draft barrier as an integral component of the exterior wall systems to prevent the passage of air, flame, and smoke from one floor to another, within the exterior wall work. Comply with the requirements of the local authorities having jurisdiction, including testing and certification requirements indicating compliance with requirements when tested in accordance with ASTM E2307

1. Design the barrier system to accept floor fire safing as an integral part of the system.

N. Sunshade Performance:

1. Structural Performance:

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a. Assembled Sunshade Assemblies: Design sunshade configurations to withstand stresses due to combined load. Stresses resulting from thermal expansion/contraction, shall not cause permanent deformation of sunshade assemblies or disengagement from the glazed system mullions.
b. Blade Deflection: Not exceeding L/120 of span length.

2. Shading Performance:

a. Configure sun shade devices to allow for negligible direct sunlight to show through the blades based on project location, latitude, altitude, building orientation, surrounding conditions, and aesthetic requirements.

O. Unacceptable Conditions: Vibration harmonics, wind whistles, noise or vibration created by thermal movement, structural movement, or wind; thermal movement transferred to building structure; loosening, weakening or failure of fasteners, attachments, or other components.

2.2 GLAZED ALUMINUM CURTAIN WALL SYSTEMS

A. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following.

1. Basis of Design: YKK AP: “YCW 750 OG Curtain Wall.”

a. FPA 15921.1-R6.
b. 7-1/2" deep system.

2. E.S. Windows. LLC.
3. West Tampa Glass Company.

B. Source Limitations: Obtain all components of curtain-wall system, including framing, spandrel panels, and accessories, from single manufacturer.

C. Framing Members: Manufacturer's extruded aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally improved.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front, unless otherwise indicated.
4. Finish: Superior performance organic finish.
5. Fabrication Method: Either factory- or field-fabricated system.
6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
7. Steel Reinforcement: As required by manufacturer.

D. Metal Closures and Trim: Fabricate from aluminum extrusions or formed from aluminum sheet; minimum 0.125-inch thickness.

1. Finish: Match framing system components.

E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

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2.3 MATERIALS, GENERAL

A. Recycled Content of Products:

1. Provide products with an average recycled content of aluminum products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 12.5 percent.
2. Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

2.4 MATERIALS

A. Aluminum: Minimum aluminum yield strength shall be as required to comply with performance requirements, but not less than 25,000 psi. Snap on elements or other aluminum extrusions that are not structurally connected to act as a single composite member shall not be considered in determining the structural capacity of the mullion.

B. Aluminum Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.

1. Sheet and Plate: ASTM B209 (ASTM B209M).
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).
3. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
4. Structural Profiles: ASTM B308/B308M.

C. Steel Reinforcement: Minimum steel yield strength shall be 36,000 psi for steel bars used to reinforce vertical mullions of the windows and curtain walls, if determined necessary by calculation. A dynamic enhancement factor of 1.2 may be applied to the yield stress for steel members, to account for strain rate effects.

1. Qualities:

a. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
b. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
c. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

2. The reinforcing steel bars and the aluminum mullions shall be structurally connected to sufficiently transfer the applied loads across the interface between the members.
3. Composite section properties of mullion components may only be used if calculations demonstrate strain compatibility across the interface.
4. Combined section properties of mullion components may be used if calculations demonstrate deformation compatibility between the aluminum and steel components.

D. Steel Reinforcement Primer: 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 in accordance with recommendations in SSPC-SP COM and prepare surfaces in accordance with applicable SSPC standard.

2.5 GLAZING

A. Glazing: Comply with Division 08 Section "Glazing."

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B. Glazing Gaskets: ASTM C509 or ASTM C864. Comply with Division 08 Section "Glazing."

1. Color: Black.

A. Glazing Sealants: As recommended by manufacturer. Comply with Division 08 Section "Glazing" and Division 07 Section "Joint Sealants."

1. Sealant shall have a VOC content of 250 g/L or less.
2. Low-Emitting Materials:

a. Interior sealants wet-applied onsite must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.

B. Structural Glazing Sealants: ASTM C1184, chemically curing silicone formulation that is compatible with system components with which it comes into contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in curtain-wall assembly indicated.

1. Color: Black.

C. Weather seal Sealants: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes into contact; recommended by structural-sealant, weather seal-sealant, and structural-sealant-glazed curtain-wall manufacturers for this use.

1. Color: Match structural sealant.

2.6 SUNSHADES

A. General: Provide sunshade system that has Florida Product Approval.

B. Sunshade Members:

1. Manufacturer's standard extruded or formed-aluminum framing members of thickness and reinforced as required to support imposed loads.

C. Fasteners and Accessories:

1. Nonmagnetic stainless steel to be non-corrosive and compatible with aluminum members, anchors, and other components.

D. Perimeter Anchors:

1. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

E. Materials

1. Aluminum Extrusions:

a. Alloy and temper recommended by glazed aluminum curtain wall and storefront manufacturer for strength, corrosion resistance, and application of required finish.
b. Not less than 0.070" (1.8 mm) wall thickness at any location for the main frame
c. Complying with ASTM B221: 6063-T6 alloy and temper

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d. Recycled Content:

1) Minimum of 50% mixed pre- and post-consumer recycled content.

2. Thermal Barrier: Manufacturer's standard nominal 0.25" (6.3 mm) thickness low conductance material.
3. Aluminum Sheet Alloy: ASTM B209/B209M.

2.7 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners including their accessory items (washers, nuts, etc.), are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration. Tighten torques as required to achieve maximum torque tension relationship required by fasteners.
2. Reinforce the interior surface with aluminum or non-magnetic stainless steel as required to receive fastener threads or provide manufacturer's standard non-corrosive pressed-in splined grommet nuts to receive fastener threads. Drill screwed connections.
3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from 300 series stainless steel, where exposed fastening is unavoidable.

B. Anchors: Three-way stainless steel adjustable anchors with minimum adjustment of 2 inch (50 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 A123/A123M or ASTM A153/A153M requirements.
2. Where anchors penetrate the air barrier, provide only stainless-steel inserts.

C. Anchors, Clips, and Accessories for Terrace Doors: Provide anchors, clips, and accessories of aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B456 or ASTM B633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

D. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, ASTM A240/A240M of type recommended by manufacturer.

E. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.8 FABRICATION

A. General: Fabricate glazed aluminum curtain wall system according to final Shop Drawings and Mockup Testing recommendations.

B. Forming: Form, break form, or extrude aluminum shapes before finishing.

C. Welding: Weld components to comply with referenced standards and shop drawings unless otherwise indicated. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

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D. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted and secured joints with ends coped or mitered.
3. Hairline joints free of burrs and distortion
4. Physical and thermal isolation of glazing from framing members.
5. Have accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from exterior. Include accommodations for using temporary support device (Dutchman) to retain glazing in place while sealant cures.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

E. Fabricate components to resist water penetration as follows:

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.
2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.

F. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard assembly method.

G. Unitized Curtain Wall Units:

1. Rigidly secure nonmovement joints.
2. Seal joints watertight unless otherwise indicated.
3. Install glazing to comply with requirements in Division 08 Section "Glazing."
4. Assemble components to drain water passing joints, condensation occurring in glazing channels and condensation occurring within framing members and moisture migrating within the system to the exterior.
5. Retain bracing or stiffening until erected to prevent racking of units during transportation and erection.

H. Metal Panels: Provide where shown, exposed aluminum panels fabricated and coordinated to install within the exterior wall construction in profiles, face dimensions and patterns as shown complete with matching reveals.

1. Fabricate panels of minimum 3/16 in. thick aluminum plate rigidized with welded concealed aluminum stiffeners as required to prevent oil-canning or other visible distress.
2. Finish panels to match finish of exterior exposed aluminum mullions unless otherwise shown or specified.
3. Metal Panel Tolerances: Fabricate panels with panel stiffeners as required to comply with deflection limits. Weld and grind panel corners smooth. Fabricate panels to the following dimensional tolerances:

   a. Length and Width: Plus, or minus 0.032 inch up to 48 inches; 0.064 inch more than 48 inches.
   b. Diagonal: Plus, or minus 0.1875 inch.
   c. Panel Bow: Not more than 0.2 percent of panel width or length up to 0.1875 inch maximum.
   d. Thickness: Plus, or minus 0.008 inch.

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e. Squareness: 0.1875-inch difference between diagonal measurements.
f. Camber: 0.032 inch.

I. Glass Spandrel Panels: Provide insulated glass panels at spandrels of type shown and specified in Division 08 Section "Glazing." Provide mineral wool insulation specified in Division 07 Section "Thermal Insulation" in the cavity behind insulated spandrel panels. Provide concealed back panels fabricated from stretcher leveled 22 gauge galvanized steel sheet. Seal back pans to aluminum framing.

J. Brackets and Reinforcement: Provide manufacturer's standard high strength aluminum brackets and reinforcements. Provide nonstaining, nonferrous shims for aligning system components.

K. Accessories: Provide components required for a complete assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, stiffeners, and similar items.

L. Fabricate and finish glazed aluminum curtain walls, metal panel systems and accessories at the factory to the greatest extent possible, utilizing manufacturer's procedures and processes necessary to fulfill indicated performance requirements.

M. After fabrication, disassemble for shipping, clearly marking components to identify their locations in Project with joinery in accordance with final Shop Drawings.

2.9 OPERABLE UNITS

A. Entrance Door Systems: Comply with Division 08 Section "Aluminum-Framed Entrances and Storefronts."

2.10 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. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Finishes Application: Apply high performance organic coatings to exposed exterior metal surfaces of glazed aluminum curtain wall system components. Apply thermosetting acrylic enamel coatings to concealed interior surfaces of glazed aluminum curtain wall system components.

1. During production, maintain large size color range samples for use in comparing against production material.
2. Adhesion and Compatibility Testing: Test samples of high performance coatings on aluminum shall be provided for compatibility and adhesion testing of joint sealants proposed for use on exterior enclosure system components prior to installations. Refer to Division 07 Section "Joint Sealants.'

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D. 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.

E. Superior-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish system consisting of corrosion inhibitive primer, fluoropolymer color coat and clear fluorocarbon topcoat, complying with AAMA 2605 and AA-C12C42R1x, containing not less than 70 percent PVDF resin by weight in color coat, in not less than 1.2 mils dry film thickness.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color and Gloss: Custom color; match Architect's control Sample.

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.

1. Verify dimensions, tolerances, and method of attachment with other related work.
2. Verify that curtain wall openings and adjoining air and vapor seal materials are ready to receive work of this section.
3. Verify that anchorage devices have been properly installed and located.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces that will contact curtain wall according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION, GENERAL

A. General: Install curtain wall system to comply with manufacturer's written instructions.

1. Do not install damaged components.
2. Rigidly secure nonmovement joints. Provide alignment attachments and shims to permanently fasten system to building.
3. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and irregularities.
4. Fit joints to produce hairline joints free of burrs and distortion.

B. Install components plumb, level, and true in alignment with established lines and grades, free from warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

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C. Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within curtain wall to exterior.

D. Provide thermal isolation where components penetrate or disrupt building insulation.

E. Install sill flashings turning up ends and edges, sealing to adjacent work to form watertight dams.

F. Anchoring and Fastening: Install and anchor accessories and components with positive anchorage to building and weathertight mounting and provide for thermal expansion in accordance with final reviewed shop drawings.

1. Anchor components with concealed fasteners and anchors.
2. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

G. Field Welding: Comply with requirements for welding and for finishing welded connections in "Fabrication Article." Weld connections that are not to be left as exposed joint but cannot be shop welded because of shipping size limitations. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.

H. Seal joints watertight unless otherwise indicated.

I. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

J. Install insulation solid in voids between and within curtain members, behind solid panels, where curtain wall abuts adjacent construction, in shim spaces as required to maintain continuity of thermal barrier in accordance with requirements in Division 07 Section "Thermal Insulation." Compress insulation to 50 percent or less of original thickness.

3.4 INSTALLATION OF OPERABLE UNITS

A. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

3.5 INSTALLATION OF GLAZING

A. Install glazing as specified in Division 08 Section "Glazing."

3.6 INSTALLATION OF INSULATION AND FIRE SAFING

A. Installation curtain wall insulation and fire safing complying with requirements specified in Section "Thermal Insulation" and the following:

1. Clean debris from behind exterior wall during erection and provide temporary closures to prevent accumulation of debris.

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2. Install firestopping/safing and smoke seal to comply with local authorities having jurisdictions.

    a. Install firestopping/safing with securely anchored metal flanges or make equivalent provisions to prevent dislocation.
    b. Install fire rated silicone smoke seal system over safing insulation to provide a complete smoke seal. Comply with Division 07 Section “Joint Firestopping”, appropriate UL listing, and local authorities having jurisdiction.

3. Install curtain wall insulation in accordance with manufacturer's written instruction utilizing materials and methods to comply with tested rated assembly if required.

    a. Retain insulation in place by metal clips and straps or integral pockets within window frames, spaced at intervals recommended by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width between insulation and glass of dimension indicated.
    b. Brace insulation where it contacts safing insulation to prevent insulation from bowing under pressure from safing insulation.

3.7 INSTALLATION OF METAL PANELS, COPINGS, FLASHINGS AND ACCESSORIES

A. Metal Panels: Install metal wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Commence metal wall panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. Flash and seal metal wall panels at perimeter of all openings. Do not begin installation until fluid applied air barrier, insulation and flashings that will be concealed by panels are installed.
4. Install flashing and trim as metal wall panel work proceeds.
5. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
6. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.
7. Attach metal wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.
8. Wet Seal Systems: Seal horizontal and vertical joints between adjacent metal wall panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Division 07 Section "Joint Sealants."
9. Install wall panels to allow individual panels to be installed and removed without disturbing adjacent panels. Coordinate installation with installation of glazed aluminum curtainwalls and seal joints between systems so entire enclosure is water and weather proof.
10. Do not apply sealants to joints unless otherwise indicated.

B. Coping Installation: Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

1. Anchor copings to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and to comply with performance requirements.

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a. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at 24-inch centers, except where more stringent requirements are specified in manufacturer's installation directions.

C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, SMACNA's "Architectural Sheet Metal Manual", and Division 07 Section "Sheet Metal Flashing and Trim." Provide concealed fasteners where possible and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant 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 weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

D. 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 wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

3.8 INSTALLATION OF SUN CONTROL ACCESSORIES

A. Comply with manufacturer's written instructions. Refer to installation instructions of the compatible curtain wall or storefront system.

B. Protect aluminum members in contact with masonry, steel, concrete, or dissimilar materials using nylon pads or bituminous coating.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure non-movement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.

G. Verify that sun control accessories' installation allows water entering the curtain wall system to be directed to the exterior. Verify weep holes are open and functioning as intended.

H. Seal joints watertight where shown on approved shop drawings and/or manufacturer's standard installation instructions.

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3.9 ERECTION TOLERANCES

A. 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 (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 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 3.6 m); 1/2 inch (12.7 mm) over total length.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Contractor's Responsibility: Furnish the testing Agency with access to the Work, materials, and facilities as required by the Agency.

1. Provide adequate notice of construction activities to allow timely inspections and observation of testing.
2. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect and test completed glazed curtain walls, metal panel and coping installation, including accessories.
3. Notify the Owner, the Construction Manager, the Architect, the Manufacturer's field Representative so that each entity may have adequate representation at the testing.
4. Test and inspect representative areas of glazed curtain walls as the work proceeds to determine compliance of installed assemblies with specified requirements.
5. The testing and inspection activities do not relieve the Contractor of responsibilities under the Contract.

C. Manufacturer's Field Service: Engage a factory-authorized service representative for the glazed aluminum curtain wall system to inspect completed installation of its specific Components, including accessories and connection to adjacent assemblies. Report results in writing.

D. Field Quality-Control Testing: Perform the following test on representative areas of glazed aluminum curtain walls.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested in accordance with AAMA 501.2 and shall not evidence water penetration.

    a. Perform a minimum of three tests in areas as directed by Architect.
    b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.

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2. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

    a. Perform a minimum of three tests in areas as directed by Architect.
    b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.

3. Water Penetration: ASTM E1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. (300 Pa) and shall not evidence water penetration.

E. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections. Following repair or replacement of failed areas, retest according to the same protocols, until construction passes testing requirements. Fabrication and installation of new areas may not proceed until tested areas have passed tests.

F. Prepare test and inspection reports.

3.11 PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as assemblies are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of glazed aluminum curtain wall installation, clean finished surfaces as recommended by each assembly manufacturer. Maintain in a clean condition during construction.

1. Debris caused by, or incidental to, the erection of the assemblies shall be removed from the site and disposed of legally.

B. After curtain wall installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace components of the glazed aluminum curtain wall system that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures before the date of Substantial Completion.

D. Institute protective measures required throughout the remainder of the construction period to ensure that the glazed aluminum curtain wall work will be without damage or deterioration, other than normal weathering, at time of acceptance.

E. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure glazed curtain wall system is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 084413

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SECTION 084443 - SUN CONTROL ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Sun control accessories, including horizontal and vertical elements.

C. Related Requirements:

1. Division 07 Section “Joint Sealants.”
2. Division 08 Section “Glazing,”

D. Single Source Requirement: To ensure compatibility and single-source responsibility for exterior glazed aluminum systems provide products of this Section made by manufacturer selected to provide Work of the following Section:

1. Division 08 Section “Glazed Aluminum Curtain Walls.”

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.to comply with requirements of Division 01 Section "Project Management and Coordination." Review methods and procedures required for glazed exterior envelope systems including but not limited to the following:

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1. Inspect and discuss condition of substrate, and other preparatory work performed by other trades.
2. Review structural loading limitations.
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. Review required inspecting, testing, and certifying procedures.
5. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For sun control devices design for integral installation with glazed aluminum curtain walls, stamped by a professional engineer licensed to practice in the State of Florida who is responsible for their preparation and who has performed the structural analysis to show compliance with performance requirements. 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 sun control accessories to the exterior.

a. Show fabrication and installation layouts of joints, element profiles, attachment system, trims, closures, and special details.

2. Include full-size isometric details of each type of vertical-to-horizontal sun control accessories intersection.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.

D. Fabrication Engineering and Design (Delegated Design) Submittal: For sun control accessories for glazed aluminum curtain walls submit comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for their preparation, indicating compliance with performance requirements specified. Submission shall include:

1. Analysis for applicable loads on horizontal and vertical elements.
2. Analysis for applicable loads transferred to glazed aluminum curtain wall.
3. Structural calculations and details of anchoring system, including type, size, and spacing of fasteners.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For professional engineer's experience with providing fabrication engineering and design services of the kind indicated, including documentation that engineer is licensed in the State of Florida.

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B. Source Quality Control Reports.

C. Field Quality-Control reports.

D. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of selected glazed aluminum curtain wall system.

B. Installer Qualifications: Installer of selected glazed aluminum curtain wall system.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Florida and who is experienced in providing comprehensive engineering services to show that glazed curtain walls designed for the project comply with performance requirements.

D. 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. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval, and only to the extent needed to comply with performance requirements. If changes are proposed, submit comprehensive explanatory data to Architect for review.

E. Mockups: Prior to installing exterior wall systems, construct mockup of glazed curtain wall with integrated sun control accessories to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution.

1. Provide materials in this section to create the composite mockup indicated.
2. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
3. Build mockup of typical wall area as shown on Drawings by full thickness, including supports, attachments, and accessories.

    a. Include, as applicable, horizontal to vertical joints.
    b. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
    c. Demonstrate the proposed range of aesthetic effects and workmanship.
    d. Obtain Architect's approval of mockups before start of Work.

4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and show recorded measurements on Shop Drawings. Provide actual locations of structural supports for glazed curtain walls. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver sun control accessory components, and other manufactured items so as not to be damaged or deformed. Package items for protection during transportation and handling.

B. Unload, store, and erect sun control accessories in a manner to prevent bending, warping, twisting, and surface damage.

C. Store components covered with suitable weathertight and ventilated covering. Do not store components in contact with other materials that might cause staining, denting, or other surface damage. Do not allow storage space to exceed 120 degrees F.

D. Retain strippable protective covering for period of construction until final acceptance.

1.9 WARRANTY

A. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    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 PERFORMANCE REQUIREMENTS

A. Comply with applicable performance requirements for glazed aluminum curtain walls, including general, structural, deflection limits, thermal movements, and sun shading effectiveness.

2.2 MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following.

1. YKK AP.
2. E.S. Windows. LLC.
3. West Tampa Glass Company.

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B. Basis of Design Product: YKK AP “ThermaShade Aluminum Sun Shade System.”

2.3 SUN CONTROL ELEMENTS:

A. General: Horizontal and vertical components designed and fabricated for anchorage or attachment to glazed aluminum curtain wall framing, glazed aluminum storefront framing, and aluminum windows.

1. Provide concealed structural components and attachment hardware.

B. Sun Control Accessories Members:

1. Manufacturer's standard extruded or formed-aluminum framing members of thickness and reinforced as required to support imposed loads.
2. Configurations: Provide assemblies indicated on Drawings.

C. Fasteners and Accessories:

1. Nonmagnetic stainless steel to be non-corrosive and compatible with aluminum members, anchors, and other components.

D. Perimeter Anchors:

1. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

E. Materials:

1. Aluminum Extrusions:

a. Alloy and temper recommended by glazed aluminum curtain wall and storefront manufacturer for strength, corrosion resistance, and application of required finish.
b. Not less than 0.070" (1.8 mm) wall thickness at any location for the main frame
c. Complying with ASTM B221/B221M: 6063-T6 alloy and temper
d. Recycled Content:

1) Minimum of 50% mixed pre- and post-consumer recycled content.

2. Thermal Barrier: Manufacturer’s standard nominal 0.25" (6.3 mm) thickness low conductance material.
3. Aluminum Sheet Alloy: ASTM B209.

2.4 FABRICATION

A. Shop Assembly: Fabricate and assemble units with joints only at intersection of aluminum members with hairline joints; rigidly secured, in accordance with manufacturer’s recommendations.

2.5 ALUMINUM FINISHES

A. Superior-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish system consisting of corrosion inhibitive primer, fluoropolymer color coat and clear fluorocarbon topcoat,

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complying with AAMA 2605 and AA-C12C42R1x, containing not less than 70 percent PVDF resin by weight in color coat, in not less than 1.2 mils dry film thickness.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color and Gloss: Custom colors: match Architect's control samples.

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.

1. Verify dimensions, tolerances, and method of attachment with other related work.
2. Verify that curtain wall framing is ready to receive work of this section.
3. Verify that anchorage devices have been properly installed and located.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.

3.3 INSTALLATION OF SUN CONTROL ACCESSORIES

A. General: Comply with installation requirements specified in Division 08 Section "Glazed Aluminum Curtain Walls."

3.4 FIELD QUALITY CONTROL

A. General: Comply with applicable field quality control requirements specified in Division 08 Section "Glazed Aluminum Curtain Walls.".

3.5 ADJUSTING AND CLEANING

A. After curtain wall installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

B. Cleaning: Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance, and remove construction debris from project site. Legally dispose of debris.

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3.6 PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as accessories are installed, unless otherwise indicated in manufacturer's written installation instructions.

B. Institute protective measures required throughout the remainder of the construction period to ensure that the Work of this Section will be without damage or deterioration, other than normal weathering, at time of acceptance.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure accessories are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 084443

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SECTION 087100 - DOOR HARDWARE

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.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.
4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Interior Aluminum Doors and Frames”.
3. Division 08 Section “Flush Wood Doors”.
4. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
5. Division 28 Section “Access Control Hardware Devices”.

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 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.

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5. ANSI/UL 437- Key Locks.

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.
    h. Warranty information for each product.
    i. Operational narratives for electrified hardware.

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.

2. Point to Point 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. Complete (risers, point-to-point) access control system block wiring diagrams.
    b. Wiring instructions for each electronic component scheduled herein.

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3. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
4. Provide engineered diagrams specific to each opening. Individual wiring instructions shipped with devices are not considered a complete diagram.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

A. 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 Procedures.

B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 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. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door 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.

D. 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 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.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source 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.

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2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing 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.

I. Pre-Installation 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 installing door hardware.

1. Prior to installation of door hardware, door hardware supplier shall 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. Hardware supplier shall engage factory personnel for installation training on locks, exit devices and door closers.

J. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 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.

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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".

1.7 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: 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.

1.8 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. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.

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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:

a. Non-removable Pins: With the exception of electric through wire hinges, 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 all out-swinging lockable doors.

5. Manufacturers:

a. Ives (IV) - 5BB Series, 5-knuckle.
b. McKinney (MK) - TA/T4A Series, 5-knuckle.
c. dormakaba BEST (ST) - F/FBB Series, 5-knuckle.

2.2 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

a. Ives (IV).
b. Pemko (PE).
c. dormakaba BEST (ST).

B. Continuous Double-Acting Hinges (Behavioral Health). ANSI/BHMA A156.26 Grade 1-300 Certified continuous hinges.

1. Provide hinges with functions and features as follows:

a. ADA compliance meeting ICC/ANSI A117.1 (2009) for barrier free compliance.
b. CMS Compliance eliminating additional ligature points ensuring compliance for
c. reimbursement through Centers for Medicare and Medicaid Services.
d. Opens 100º in either direction.
e. Built-in stop to prevent finger pinching.
f. Spans the entire opening height eliminating hinge side sight lines.
g. Provide an emergency release stop to create a complete anti-barricade system with a flush bolt that is used to release the door in emergency situations that allows it to swing in the opposite direction. Stop shall be supplied standard with Torx security screws and hospital tips.

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2. Manufacturers:

   a. Markar Products; ASSA ABLOY Architectural Door Accessories (MR) - DSH1000.
   b. Pemko (PE) - DSH1000 Series.

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets with a 1-year warranty. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

   1. Manufacturers:

      a. Ives (IV) - Connect.
      b. McKinney (MK) - QC (# wires) Option.
      c. dormakaba BEST (ST) - C Option.

B. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

   1. Manufacturers:

      a. Pemko (PE) - EL-CEPT Series.
      b. dormakaba BEST (ST) EPT-12C Series.
      c. Von Duprin (VD) - EPT-10 Series.

C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

   1. Provide one each of the following tools as part of the base bid contract:

      a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
      b. McKinney (MK) - Connector Hand Tool: QC-R003.

   2. Manufacturers:

      a. McKinney (MK) - QC-C Series.
      b. dormakaba BEST (ST) - WH Series.
      c. Von Duprin (VD) - Connect.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

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1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. 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.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

    a. Ives (IV).
    b. Rockwood (RO).
    c. Trimco (TC).

B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

    a. Ives (IV).
    b. Rockwood (RO).
    c. Trimco (TC).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
2. Manufacturers:

    a. Ives (IV).
    b. Rockwood (RO).
    c. Trimco (TC).

2.5 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.

1. Manufacturers:

    a. dormakaba BEST (BE).
    b. Match FSU standard.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. 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.
6. Keyway: Match existing FSU key system.

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C. Small Format Interchangeable Cores: Provide small format interchangeable cores (SFIC) as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.

D. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.

1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
2. Manufacturers:
    a. dormakaba BEST (BE) - CORMAX.
    b. No Substitution.

E. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

F. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Three (3).
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

G. Construction Keying: Provide temporary keyed construction cores.

H. Delivery and Installation: Deliver permanent cores and keys to FSU lock shop for installation by FSU staff.

I. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:
    a. Lund Equipment (LU).
    b. MMF Industries (MM).

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c. Telkee (TK).

2.7 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1: Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. dormakaba BEST (BE) - 45H Series.
c. Sargent Manufacturing (SA) - 8200 Series.

2.8 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 2: ANSI/BHMA A156.2, Series 4000, Grade 2 Certified Products Directory (CPD) listed. Locks are to be non-handed and fully field reversible.

1. Provide locksets with functions and features as follows:

a. Meets ANSI/BHMA A156.41 for single motion egress.
b. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
c. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
d. Meets Florida Building Code FL2998 and UL Certification Directory ZHEM.R21744 for latching hardware for hurricane requirements.
e. Five-year limited warranty for mechanical functions.

2. Manufacturers:

a. Corbin Russwin Hardware (RU) - CL3800 Series.
b. dormakaba BEST (BE) - 7KC Series.
c. Sargent Manufacturing (SA) - 7 Line.

2.9 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.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

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 A156.36.

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4. Dustproof Strikes: BHMA A156.16.

2.10 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes conforming to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Manufacturers:

   a. HES (HS) - 1600 Series.
   b. Security Door Controls (SD) - 55 Series.
   c. Von Duprin (VD) - 6200 Series.

2.11 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. 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.
3. 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.
4. 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.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with 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.
   b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

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B. Conventional Push Rail Exit Device: ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Von Duprin (VD) - 99 Series.
b. No Substitution.

2.12 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.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. 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 Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed 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. Large body cast iron surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:

a. Corbin Russwin Hardware (RU) - DC8000 Series.
b. LCN Closers (LC) - 4040XP Series.

2.13 ELECTROMECHANICAL DOOR OPERATORS

A. Electromechanical Door Operators: Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that are UL325/991 and UL10C certified and comply with requirements for the Americans with Disabilities Act (ADA). Operators shall accommodate openings up to 250 pounds and 48” wide.

1. Provide operators with features as follows:

a. Non-handed with push and pull side mounting.
b. Activation by push button, hands-free or radio frequency devices.
c. Adjustable opening force and closing power.
d. Two-year limited warranty.

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2. Maintenance Strut: Integral strut to positively support ramp in up position during maintenance of dock leveler.

K. Integral Laminated-Tread Dock Bumpers: Fabricated from 6-inch (152-mm) thick, multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two 3/4-inch- (19-mm-) diameter, steel supporting rods that are welded at one end to 1/4-inch- (6-mm-) thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than 1 inch (25 mm) of tread plies extending beyond the face of closure angles.

L. Materials:

1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
2. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from steel plate complying with ASTM A572/A572M, Grade 55 (380).
3. Steel Tubing: ASTM A500/A500M, cold formed.
4. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

M. Dock-Leveler Finish: Hot-dip galvanized.

1. Toe Guards: Baked-on factory finish.

N. Accessories:

1. Curb Angles: 3-by-3-by-1/4-inch (76-by-76-by-6-mm) galvanized-steel curb angles for edge of recessed leveler pit, with 1/2-inch- (13-mm-) diameter by 6-inch- (152-mm-) long concrete anchors welded to angle at 6 inches (152 mm) o.c.
2. Night Locks: Manufacturer's standard means to prevent extending lip and lowering ramp when overhead doors are locked.
3. Side and rear weatherseals.
4. Foam insulation under dock-leveler platform.
5. Smooth surface.

2.3 BUMPERS

A. Steel-Face, Laminated-Tread Bumpers: Fabricated from multiple, uniformly thick plies cut from fabric-reinforced rubber tires and with 3/8-inch steel face plate of same size as rubber surface. Laminate plies under pressure on not less than two 3/4-inch- diameter, steel supporting rods that are welded at one end to 1/4-inch- thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than 1 inch of tread plies extending beyond the face of closure angles. Weld face plate to two steel support brackets, which shall extend back to and engage 3/4-inch- diameter support rods in elongated holes, allowing steel face to float on impact.

1. Attach bumpers to bollards, as indicated on Drawings.

B. Manufacturers and Products:

1. Laminated Rubber Dock Bumpers: Rite-Hite Corporation.
2. SPX Dock Products: Kelley or Serco.
3. Laminated Dock Bumper: Pentalift.

C. Steel-Face, Laminated-Tread Dock Bumper:

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e. Wi-Fi interface where the operator is a secure, password protected WiFi hot spot with no connection to building's IT required.
   1) Simple setup with no app required.
   2) View status and make adjustments without removing the cover.
   3) Built-in logic to support single use restroom applications with no external relay boards, logic modules, position switches required.
f. Mounting backplate to simplify and speed up installation.
g. Integration with access control systems.

2. Operators shall have the following functionality:
   a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
   b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.
   c. Emergency Interface Relay: Door closes and ignores any activation input until signal is discontinued.
   d. Infinite Hold Open: Door will hold open at set position until power is turned off.
   e. Latch Assist: At closed position, after an activation, the door is pulled in. After the door has closed, the door is pulled in to assist with latch release/engagement.
   f. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
   g. Open Delay: Delays operator opening for locking hardware.
   h. Outside Wall Switch Disable: When contact is closed, outside wall switch is disabled.
   i. Power Assist: Senses the door is being opened manually and applies small amount of power to assist the user in opening the door with force less than 5 lbs. The door opens only as far as it is moved manually, then closes once released.
   j. Power Close: Additional force to assist door closing between 7° and 2°.
   k. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.
   l. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.
   m. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.
   n. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.
   o. Executive Mode Feature: When the door receives an activation signal it opens and remains open until either a second signal is received, or the door is manually moved in closing direction.

3. Manufacturers:
   a. ASSA ABLOY Entrance Systems (BE) - SW200 Series.
   b. No Substitution.

2.14 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.

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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. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:

    a. Ives (IV).
    b. Rockwood (RO).
    c. Trimco (TC).

2.15 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 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. Manufacturers:

    a. Ives (IV).
    b. Rockwood (RO).
    c. Trimco (TC).

2.16 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 NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

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D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

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. Manufacturers:

1. National Guard Products (NG).
2. Pemko (PE).
3. Zero (ZE).

2.17 ELECTRONIC ACCESSORIES

A. Actuator Switch: 6” x 36” low profile contoured design with easy activation from any angle, Kinetic by Camden no battery.

1. Manufacturers:

a. Camden Door Controls (CC) – CM-7536 Series.
b. No Substitution.

2.18 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.

2.19 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.

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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. DHI TDH-007-20: Installation Guide for Doors and Hardware.
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. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. 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 (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

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1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

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. 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.

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SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 CONTROLLING DOCUMENTS

A. This specification is controlled by Division 08 Section “Exterior Enclosure System Requirements”. In addition to the requirements of this document, all requirements of Controlling Documents must also be met. The more onerous conditions of this document or the Controlling Document must be met.

1.2 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. This Section includes, but is not limited to glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Aluminum-framed storefront and entrances.
4. Glazed aluminum curtain walls.
5. Glazed interior and exterior entrances.
6. Sloped glazing assemblies.
7. Exterior glazed decorative metal railings.
8. Glazed decorative metal curtains (baffles).
9. Glass shelves.
10. Glazing sealants and accessories.

C. Related Requirements:

1. Division 05 Section "Glazed Decorative Metal Railings" for railings to be glazed.
2. Division 05 Section “Glazed Decorative Metal Curtains” for structural glass curtains (baffles).
3. Division 07 Section "Joint Sealants".
4. Division 08 Section “Exterior Enclosure System Requirements.”
5. Division 08 Section "Aluminum-Framed Entrances and Storefronts."
6. Division 08 Section "All-Glass Entrances and Storefronts."
7. Division 08 Section "Sliding Storefronts."
8. Division 08 Section "Glazed Aluminum Curtain Walls."
9. Division 08 Section "Sloped Glazing Assemblies."
10. Division 08 Section "Security Windows."
11. Division 08 Section "Decorative Glass Glazing."
12. Division 08 Section "Glass Paneling" for glass paneling and glass shelves.
13. Division 08 Section "Security Glazing."

D. Single Subcontract Responsibilities:

1. Refer to Division 05 Section "Glazed Decorative Metal Railings" for requirements of single subcontract responsibilities for glazing in conjunction with glazed decorative metal railings.

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2. Refer to Division 08 Section "Aluminum-Framed Entrances and Storefronts" for requirements of single subcontract responsibilities for glazing in conjunction with aluminum-framed entrances and storefronts.
3. Refer to Division 08 Section "All-Glass Entrances and Storefronts" for requirements of single subcontract responsibilities for glazing in conjunction with all-glass entrances and storefronts.
4. Refer to Division 08 Section "Glazed Aluminum Curtain Walls" for requirements of single subcontract responsibilities for glazing in conjunction with glazed aluminum curtain walls.
5. Refer to Division 08 Section "Sloped Glazing Assemblies" for requirements of single subcontract responsibilities for glazing in conjunction with sloped glazing assemblies.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036. Nominal glass thicknesses will be called out in this document. The more onerous of maximum or minimum thicknesses as defined in ASTM C1036 shall be used in all calculations and dimensions

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

E. 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.

F. 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.

G. 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 COORDINATION

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

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

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2. Review temporary protection requirements for glazing during and after installation.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of glass and glazing product.

B. Installation Instructions: For each type of product.

C. Shop Drawings: Include elevations, sizes, dimensions, materials, edge details, anchorage, hardware, and attachments to other work. Show sections and profiles of panel units, arrangement and provision for jointing, anchoring and fastening, supports and other installation details. Indicate locations of panels on elevations. Show large scale details of edge conditions and typical conditions.

1. Include information on size, edge seal, toggle channels, stamp and location for glazing coordinated with submittals for Division 08 Section "Exterior Enclosure Requirements".

D. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

E. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch lengths.

1. Install sealant Samples between two strips of material representative in color of the adjoining framing system. Provide seal width and edge deletion for structurally glazed IGUs.

F. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer, manufacturers of insulating-glass units with sputter-coated, low-E coatings, glass testing agency, and sealant testing agency.

B. Fabrication Engineering Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed to practice in the jurisdiction of the project and responsible for their preparation.

C. Product Certificates: For glass and glazing from manufacturer, evidencing compliance with testing requirements.

1. Certification: Provide certification from glass producer/fabricator or Exterior Wall Engineer that glass producer/fabricator has reviewed all glazing details and thicknesses and finds same suitable for the purpose intended in accordance with these specifications. This shall include a written structural, wind load, and thermal stress analysis and calculations, showing a probability of failure of no greater than eight (8) lites per thousand for vertical panels and one (1) lite per thousand for horizontal panels at the performance and test loads and local climatic thermal conditions.
2. Certification, Tempered Glass Testing: Submit certification that tempered glass intended for use on the project has been heat soaked tested in accordance with EN14179-1 “Heat Soaked Thermally Toughened Soda Lime Silicate Safety Glass”.
3. Certification, Insulating Glass Testing: Submit certification that the insulating glass units have been granted the labelling in accordance with ASTM E2190 compliance for insulated glass units.

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4. Certification, Insulating Glass: Provide certification that insulating glass primary and secondary seals are capable of withstanding project structural loading requirements.

D. Fabricator's quality control/quality assurance procedures.

E. Product Test Reports: For coated glass, insulating glass, and glazing sealants, for tests performed by a qualified testing agency.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

F. Florida Building Commission Product Approval Evaluation Report: For exterior glazing, from the Florida Building Commission Product Approval Section.

G. Preconstruction adhesion and compatibility test report.

H. Structural-Sealant-Glazing Quality-Control Program Reports: Documenting quality-control procedures and verifying results for structural sealant sloped glazing systems.

I. Sample Warranties: For special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Digital data of frit patterns, screens necessary to achieve the Architect's custom frit, and to maintain throughout the life of the curtain wall. Coordinate submittal with requirements specified in "Glazing Schedule" at the end of Part 3 of this Section.

B. Maintenance Data: For each type of glass and each applied coating to include in maintenance manuals.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program or has demonstrated 5-year experience on projects of comparable size and scope and has foremen who can demonstrate that they have taken online classes given by the National Glass Association at myglassclass.com in the specialties they are engaged to provide.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

E. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

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F. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of Insulating Glass Certification Council (IGCC).

G. Mockups: Before glazing, build mockups for each glass product indicated below, to verify selections made under sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work.

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Install glazing in mockups specified in the following Sections to match glazing systems required for Project, including glazing methods.
    a. Division 05 Section "Glazed Decorative Metal Railings."
    b. Division 08 Section "Aluminum-Framed Entrances and Storefronts."
    c. Division 08 Section "All-Glass Entrances and Storefronts."
    d. Division 08 Section "Glazed Aluminum Curtain Walls."
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Obtain Architect's approval of mockups before starting fabrication.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed.
7. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

B. Comply with requirements specified in Sections "Exterior Enclosure System Requirements", "Glazed Aluminum Curtain Walls", "and "Structural Silicone Glazed Aluminum Curtain Walls" for field hose testing of glass panels installed in assemblies erected in the work of those sections.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

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B. For insulating glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.12 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

B. Field Measurements: Verify actual dimensions of openings and construction contiguous with glass by field measurements before fabrication.

1.13 WARRANTY

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

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

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

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

C. Manufacturer's Special Warranty for Heat-Soaked Tempered Glass: Manufacturer agrees to replace heat soaked tempered glass (FT) units that spontaneously break due to nickel sulfide (NiS) inclusions at a rate exceeding 0.3 percent (3/1000) with within specified warranty period.

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

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

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

E. Manufacturer’s Special Warranty on Sealant: Manufacturer's standard form in which sealant manufacturer agrees to repair or replace silicone sealant compounds which have failed within specified warranty period. Failure includes, but is not limited to, failure to provide airtight and watertight joints or which have failed in adhesion, cohesion, abrasion-resistance, migration-

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resistance, stain-resistance, general durability or other form of apparent deterioration (excluding inherent qualities and limitations clearly specified in the manufacturer's data which was submitted).

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Manufactured items listed are the Basis of Design selected for the project and serve as the standard of quality required for the project. Equivalent products by other manufacturers/fabricators listed in this section will be considered, provided they match the aesthetic and performance of the items designated. Items that do not match aesthetic and performance characteristics will be rejected. The Architect has the final approval.

B. Manufacturers: Subject to compliance with requirements, provide products from one of the following:

1. Guardian Glass Industries.
2. Asahi Glass (AGC).
3. Pilkington North America.
4. Schott-North America, Inc.
5. Vitro Architectural Glass (Formerly PPG).

C. Fabricators: Subject to compliance with requirements, provide products by one of the following:

1. Guardian Glass Industries.
2. Interpane, a Division of AGC Glass Company North America, Inc.
3. Old Castle Building Envelope.
4. Press Glass, Inc.
5. Viracon, Inc.

D. Source Limitations for Glass: Obtain each type of glass from single source from single manufacturer.

1. Obtain primary glass from single source from single manufacturer.
2. Obtain heat-treated glass from single source from single manufacturer.
3. Obtain laminated glass from single source from single manufacturer.
4. Obtain insulating glass from single source from single manufacturer.
5. Obtain low-E-coated glass from single source from single manufacturer.
6. Obtain ceramic coated glass from single source from single manufacturer.

E. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

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2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Fabrication Engineering and Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements", and the local building code, to engineer glass and glazing, including comprehensive engineering analysis according to ASTM E1300.

1. Glass Thicknesses indicated are minimums and for detailing only. Confirm glass thicknesses and heat treatment by analyzing Project loads and in-service conditions.
2. Provide glass lites for various openings in nominal thickness indicated, but not less that the thickness and strength (including heat treatment) as required to comply with performance criteria specified.

C. Structural Performance: Except as modified by requirements of this section glazing shall be engineered, fabricated and installed to withstand design wind loads, seismic loads, sidesway, live and deadloads, structural movement, deflections within limits and under conditions indicated determined according to the 2023 Florida Building Code and ASTM E1300, and performance requirements specified in Division 08, Section "Exterior Enclosure System Requirements", and as indicated on drawings.

1. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, engineer glass to resist wind pressure based on glass type factors for short-duration load.
2. Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, engineer glass to resist each of the following combinations of loads.
3. Outward wind pressure minus the weight of the glass. Base on glass type factors for short-duration load.
4. Inward wind pressure plus the weight of the glass plus half of the snow load. Base on glass type factors for short-duration load.
5. Half of the inward wind pressure plus the weight of the glass plus the snow load. Base on glass type factors for long-duration load.

    a. Load Durations: Engineer glass for load duration factors in accordance with ASTM E1300. For wind loading assume a duration factor of 1.0, for Patterned and Sandblasted Glass assume:

        1) Short-Duration Glass Type Factor for Patterned Glass: 1.0.
        2) Long-Duration Glass Type Factor for Patterned Glass: 0.6.
        3) Short-Duration Glass Type Factor for Sandblasted Glass: 0.5.

6. Horizontal Loads: Glazing shall be designed, fabricated, and installed to withstand the following uniform horizontal loads as required by the Florida Building Code, Eighth Edition (2023):

    a. Interior Entrances: 5 psf.
    b. Interior Storefronts: 5 psf.

7. Thickness of Patterned Glass: Base patterned glass on thickness at thinnest part of the glass, but in no case less than 1/4 inch (6 mm).
8. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm for monolithic glass lites, and 5 mm for laminated glass assemblies.
9. Probability of Breakage for Vertical Glazing (except for tempered glazing which is 0.3%): 8 lites per 1000 for lites under wind action.

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a. Load duration: 60 seconds or less.

10. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, engineer glass for a probability of breakage not greater than 0.001 under wind action.

    a. Load duration: 30 days.

11. Maximum Lateral Deflection:

    a. For Glass Supported on All Four Edges: Limit center-of-glass deflection at wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
    b. For Glass Supported on Two Edges:
        1) For unsupported glass edge dimension (L) of 13 feet 6 inches or less, maximum unsupported glass edge deflection shall be L/175 or 3/4 inch whichever is less.
        2) For unsupported glass edge dimension (L) of greater than 13 feet 6 inches, maximum unsupported glass edge deflection shall be L/240 plus 0.25 inch.
    c. Cantilevered Glass: For cantilevered glass dimension (L), maximum cantilevered glass deflection shall be 2L/175, or 0.75 inch, whichever is less.

12. Differential Shading and Heat Build Up: Engineer glass to resist thermal stresses induced by differential shading within individual glass lites.
13. Insulated Glass Units: Design of insulated glass units shall account for the building altitude, temperature, atmospheric pressure, and specified loads.
14. Laminated Glass Units: Structural design of laminated glass units shall account for the stiffness of the interlayer material and in-service material design temperature, but not less than 70 degrees F.
15. Ceramic Coated Glass and Acid-Etched Glass: Structural design of ceramic coated glass and acid-etched glass shall account for the reduction in glass strength due to the ceramic coating process and acid-etching process.

D. Florida Building Commission Product Approval Listing: Exterior glazing and component materials shall comply with requirements in the Florida Building Code, Eighth Edition (2023), as part of a glazing system, and shall be listed in the Florida Building Commission's Product Approval Listing for glazing system identical for that specified for this Project.

E. Tempered Glass: Unless otherwise specified tempered glass intended for use on the project shall be heat soaked tested in accordance with EN 14179-1 “Heat Soaked Thermally Toughened Soda Lime Silicate Safety Glass” for a minimum of 2 hours at not less than 260 deg C. to minimize the occurrence of nickel sulfide crystals. This process shall be strictly controlled and carried out paying attention to temperature limits and duration of treatment for each phase.

1. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.
2. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

F. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by window wall systems without failing adhesively or cohesively. Provide sealant that fails cohesively before sealant releases from substrate when tested for adhesive compatibility with each substrate and joint condition required.

1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.

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2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

G. Structural Glazing: Limit the stresses on structural glazing sealant under full loads and maximum building deflections, to produce sealant stress not exceeding 20 psi with a minimum safety factor of 5:1 in accordance with ASTM C1249 and the sealant manufacturer's instructions.

H. Safety Glazing: For glass panels that are accessible to pedestrians (and not protected by an 18-inch high obstruction) and glass in doors and door sidelights, and where safety glazing is indicated or required by Building Code, provide glazing that complies with 16 CFR 1201, Category II.

1. Permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
2. European alternate for certification of safety glazing is acceptable. All laminated glass is safety glazing.

I. Water Immersion: Engineer insulating glass units and laminated glass assemblies to be free of water immersion. Exposed laminated glass edges shall be engineered and fabricated to drain freely.

J. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

K. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 6.3 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 6.3 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. National Glass Association NGA Publications: "Laminated Glazing Reference Manual" and "GANA Glazing Manual" and "Sealant Manual".
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
3. FGIA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
4. FGIA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

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5. Consumer Product Safety Commission (CPSC): Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of CPSC 16 CFR Part 1201 for category II materials.

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of [**the SGCC**] [**the SGCC or another certification agency acceptable to authorities having jurisdiction**] [**or**] [**manufacturer**]. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

1. Subject to compliance with requirements and local authorities having jurisdiction, provide safety glass with a removable certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum and is for detailing only Confirm glass thickness and heat treatment necessary for glass unit sizes required against performance requirements for exterior glazing and in-service conditions. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 1/4 inch (6 mm).
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

E. Strength:

1. Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article.
2. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article.
3. Where fully tempered float glass is indicated, provide fully tempered float glass.

F. Glass for Heat Treatment:

1. Glass with Thermal Stress Induced by Differential Shading: Provide heat-strengthened float glass in place of annealed float 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.
2. Low-E Coated Glass: Provide heat-strengthened float glass for all Low-E coated vision glass (outboard lites of insulated units).
3. Ceramic-Coated Spandrel Glass: Provide heat-strengthened float glass for all ceramic-coated spandrel glass (inboard lites of insulated units).

G. Sizes and Cutting for Heat Treated Glass: Prior to heat treatment, cut glass to required sizes as determined by accurate measurement of openings to be glazed, making allowance for required edge clearances. Cut and process edges in accordance with glass manufacturer's recommendations. Do not cut or treat edges in the field.

H. Flatness Tolerances for Heat Treated Glass: All heat treated glass shall be fabricated to the following flatness tolerances:

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1. Overall Bow and Warp: Maximum bow and warp tolerances in any direction as listed in ASTM C1048, Table 2. Localized warp limited to 0.03 inches in 12 inches.
2. Roll Wave: The deviation from flatness at any peak (peak to valley deviation) shall not exceed 0.003 inches in the center of lites, and shall not exceed 0.008 inches within 11.3 inches of the leading or trailing edge, for 6 mm thick glass.

I. Heat Soaking for Tempered Glass: All tempered glass shall be heat soaked in accordance with EN 14179-1. Statistical heat soaking shall not be permitted. The purpose of the heat soak destructive test is to convert nickel sulfide inclusions from the alpha phase to the beta phase to cause the glass to fracture during the test.

1. Holding Phase Glass Surface Temperature: 260 degrees C, maximum, plus or minus 10 degrees C.
2. Holding Phase Duration: 2 hours minimum.
3. After heat soak testing, all tempered glass shall be checked for minimum residual compressive surface stresses in accordance with ASTM C1048.
4. After heat soak testing, all tempered glass shall be checked for safety glazing performance in accordance with 16 CFR Part 12 and ANSI Z97.1.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.

B. Low Iron Float Glass: ASTM C1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent and solar heat gain coefficient of not less than 0.87. Subject to compliance with requirements, provide one of the following:

1. AGC Glass Company North America, Inc.; Clearvision.
2. Guardian Industries Corp.; UltraClear.
3. Pilkington North America; Optiwhite.
4. Vitro Architectural Glass Starphire.

C. Tinted Annealed Float Glass: ASTM C1036, Type I, Class 2 (tinted), Quality-Q3.

D. Heat-Treated Float Glass: ASTM C1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Flatness Tolerances: Overall bow and warp shall not exceed 50 percent of values tabulated in ASTM C1048.
2. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
3. Fully Tempered Glass: Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
    a. Tempered architectural safety glass shall conform to ANSI Z97.1 and CPSC 16 CFR 1201.
4. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated. Direction of roller wave shall be consistent throughout building. Measurements of roller wave shall be performed in accordance with ASTM C1651.
    a. Roller wave peak-to-valley deviation shall not exceed 0.003 inch “Peak to Valley” in the central area and 0.008 inch within 10-1/2 inches of the leading and trailing edge.

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5. ASTM C1048 for uncoated glass, comply with requirements for Condition A.
6. ASTM C1048 for coated vision glass, comply with requirements for Condition B for fully or partially ceramic coated glass, and Condition C (other coated glass).
7. Provide heat soak testing for all tempered glass, conforming to EN 14179-1: 2016 which includes a 2-hour dwell at 482°F ± 18°F (260°C ± 10°C).
8. After heat soak testing, all tempered glass shall be checked for

    a. minimum residual compressive surface stresses in accordance with ASTM C1048.
    b. safety glazing performance in accordance with 16 CFR Part 12 and ANSI Z97.1

E. Low-Emissivity (Low 'E') Sputter-Coated Coated Vision Glass: Provide low-emissivity factory applied coating complying with ASTM C1376 and resulting in a stable, uniform, nearly invisible coating which imparts average maintained insulating performance of at least U = 0.4. Comply with physical performance criteria as specified herein for each individual type of glass.

1. Provide accurate and straight edge deletions of coatings at areas of insulating glass assemblies where Low “E” coatings, metallic coating or other decorative coatings are applied to surfaces scheduled to be in contact with the primary seal of insulating glass units.

F. Ceramic-Coated Spandrel Glass: ASTM C1048, Type I, Condition B, Quality-Q3 and complying with NSA "Engineering Standards Manual" 66-9-20 Specification for Heat-Strengthened or Fully Tempered Ceramic Enameled Spandrel Glass for Use in Building Window/Curtain Walls and other Architectural Applications..

G. Acid-Etched Glass: As follows:

1. Refer to primary and heat-strengthened glass requirements relating to properties of glass comprising acid-etched glass products.
2. Textures and Patterns: Provide textures and patterns to match Architect's samples.
3. Acid-Etching Process: Fabricate acid-etched glass with hydrofluoric and hydrochloric acid according to manufacturer’s standard process. Acid etched finish shall have a high quality uniform finish. Acid etched finish and shall be highly resistant to staining from oils or human contact.

    a. Abrasive blast etching is not permitted.

2.5 COATED FLOAT GLASS

A. General: Provide coated glass complying with requirements indicated in this Article

B. Sputter-Coated Float Glass: Float glass with the coating(s) specified in schedules at the end of Part 3, deposited by magnetron sputtered vacuum deposition process after manufacture and heat treatment (if any). Pyrolytic, and wet chemical deposition, glass coatings will not be permitted.

C. Coating Quality: The allowable range of defects in coatings applied to glass shall be as accepted through glass sample submissions. Installed coated glass products which are outside of the accepted sample range shall be subject to rejection by the Architect. To reduce the possibility of glass rejection, the supplier of coated glass products shall provide glass coating production runs for the entire project from a single coating facility. The allowable range of defects are defined as follows:

1. The vision glass area is defined as the field of glass which is greater than 3 inches (76 mm) from the glass unit edge.

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a. Pinholes: At an indoor viewing distance of 6 feet (1829 mm) for low emissivity coatings, and 15 feet (4572 mm) for reflective coatings:
   1) Pinholes greater than 1/16 inch (1.5 mm) in dia. shall not be permitted;
   2) Large clusters or close spacing of pinholes 1/16 inch (1.5 mm) and smaller shall not be permitted in the vision glass area; and
   3) Large clusters or close spacing of pinholes 1/16 inch (1.5 mm) and smaller may be permitted outside of the vision glass area subject to Architect's acceptance.

b. Scratches: At an indoor viewing distance of 10 feet (3048 mm) for low emissivity coatings, and 15 feet (4572 mm) for reflective coatings:
   1) Scratches smaller than 3 inches (76 mm) long are allowed in any glass area;
   2) Scratches from 3 inches to 4 inches (76 mm to 102 mm) long are allowed only within 3 inches (76 mm) of an edge; and
   3) Scratches greater than 4 inches (101 mm) long shall not be permitted in the vision glass area.
   4) Concentrated scratches, scuffs, rub marks, cup marks or abraded areas shall not be permitted in any glass area.

c. Reflectance and Transmission Inspection: When viewed outdoors against a bright uniform opaque background at a 10 ft. (3048 mm) distance for low emissivity coatings (15 feet (4572 mm) for reflective coatings), color, reflectance and transmission will be permitted to have a slight variance subject to Architect's acceptance.
   1) Mottling and streaking of the coating shall not be permitted.

2.6 LAMINATED GLASS

A. Laminated Glass: ASTM C1172 and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Blemishes that may form or grow over time shall not exceed the limits defined in ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation. Misalignments between laminated lites may not exceed 1/32 inch. At edges, where PVB interlayers may contact silicone sealant, provide 3M glazing tape recommended for separation of silicone and PVB interlayer.

B. Polyvinyl Butyral Interlayer: Polyvinyl butyral sheets of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.

1. Laminate lites with polyvinyl butyral interlayer in autoclave with heat plus pressure.
2. Provide clear polyvinyl butyral sheets for laminating clear glass.
3. Provide ultraclear polyvinyl butyral sheets for laminating ultraclear (low-iron) glass.
4. Products: Subject to compliance with requirements, provide the following.
   a. Kuraray America, Inc.; Trosifol Clear (For laminating clear glass.)
   b. Kuraray America, Inc.; Trosifol UltraClear (For laminated ultraclear (low-iron) glass.

C. Ionomeric Polymer (Ionoplast) Interlayer (for Structural Glass Systems): Ionomeric polymer (ionoplast) interlayer sheets of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.

1. Laminate lites with ionoplast interlayer in autoclave with heat plus pressure.
2. Provide clear ionoplast sheets for laminating clear glass.

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3. Ionoplast Interlayer Properties:

    a. Young's Modulus: 43 kpsi, when tested in accordance with ASTM D5026
    b. Tensile Strength: 5.0 kpsi, when tested in accordance with ASTM D638.
    c. Elongation: 400 percent, when tested in accordance with ASTM D638
    d. Flex Modulus: 50 kpsi, when tested in accordance with D790.
    e. Heat Deflection Temperature at 0.46 MPa: 110 deg F, when tested in accordance with D648.

4. Edge Stability: Laminate lites with ionoplast interlayer shall have zero defects for open-edge weather exposure and butt-joined silicone sealant contact when tested for 84 months.
5. Product: Subject to compliance with requirements, provide the following. No substitutions allowed.

    a. Kuraray America, Inc.; Trosifol Structural, Sentry Glas, Clear.

D. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.

1. Construction: Laminate glass with interlayer to comply with interlayer manufacturer's written instructions.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.
4. Where laminated glass is held using sealants, verify compatibility of interlayers and sealant with sealant manufacturer.

E. Laminated Safety Glass Units: Two sheets of glass of equal thickness, laminated together with not less than 1.52 mm thick clear interlayer, made specifically for laminating glass. At glazed doors and sidelights, provide glass complying with the requirements of 16 CFR 1201 Category II.

1. Prior to laminating, cut glass to required sizes and profiles as determined by accurate measurement of openings to be glazed, making allowance for required edge clearances. Cut and process edges in accordance with glass manufacturer's recommendations. Do not cut or treat edges in the field.

2.7 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190, and complying with other requirements specified.

1. Sealing System: Dual seal, with polyisobutylene polymer spacer/sealant and silicone sealant, or pre-applied acrylic adhesive for glass bonding to metal spacer, and polyisobutylene and silicone primary and secondary sealants.
2. Fabricate units at factory with sheets of glass hermetically sealed at edges with a permanent elastomeric sealant. Dehydrate entrapped air. Glass lights with bent, welded or fused corners, splices or joints shall be separated by desiccant filled d spacer specified below, marked with the appropriate classification, listed manufacturer and approval marked on the spacer
3. Spacer:

    a. Polyisobutylene polymer spacer/sealant.

        1) Product: Viracon; "Viracon Thermal Spacer (VTS); black color.

    b. Aluminum with black, color anodic finish.
    c. Black colored stainless steel.

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4. Desiccant: Integral with polyisobutylene polymer, molecular sieve, or silica gel, or a blend of molecular sieve and silica gel.
    a. Desiccant Temperature Rise Testing:
        1) Test Criteria: Comply with desiccant manufacturer's written recommendations.
        2) Test minimum of once every shift and after each drum change.
5. Insulating Glass Unit Requirements Testing:
    a. Test insulating glass units.
    b. Butterfly Unit Adhesion Pull Testing.
        1) Adhesion Criteria: Comply with pass/fail requirements of manufacturer's published minimum guidelines and manufacturer's certification audit requirements/recommendations. Minimum pull back to 30 degrees from horizontal with no significant adhesive failure.
        2) Test one unit each shift after each carton change.
        3) Minimum size 8 inch x 8 inch (200mm x 200 mm).
        4) Test units shall be fabricated at the same time and on the same production line as processing equipment with same spacers and sealant used in the production of the insulating glass units fabricated for the Project.
6. Bow/Warp and Air Space Measurement Concave/Convex: Submit manufacturer's quality assurance/quality control measures to comply with the intent of this section.
    a. Measure bow warp every hour on a vertical plane with aluminum or other type of straight edge.
7. Skips and voids in the primary or secondary seals are prohibited and maximum gap at primary/secondary seal interface is 1 inch in length and 3/32 inch in width.
8. Documentation:
    a. Document and record results.
    b. Tag each insulating Glass Unit that falls outside the defined limits and certify that these non-conforming insulating glass units will not be supplied to the Project.
9. Quality Assurance: Provide method to assure spacer is square to the edge, polyisobutylene seal is within acceptable visual tolerances per mockup. In addition, provide quality assurance measures to control:
    a. Spacer Alignment, location, polyiso bleed.
    b. Air initial fill.
    c. Altitude effects.
    d. Barometric Pressure variation effects.
10. Low E Coating Edge Deletion in Insulating Glass Units: Provide accurate and straight edge deletions of coatings at areas of insulating glass assemblies where coatings, metallic coating or other decorative coatings are applied to surfaces scheduled to be in contact with the primary seal of insulating glass units or provide masking of edge to prevent low "E" coating from continuing to bonded edge.
    a. In IGUs, provide "Red line" installation, overlapping low e coating and primary seal no more than 50% of thickness of primary seal.

B. Provide insulating glass units with breather devices to compensate for atmospheric pressure differential between the site of unit fabrication and the site of installation, where an altitude differential of more than 2000 ft. exists.

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C. Low-E Coated Insulating Vision Glass Products, General: Performance characteristics designated for coated insulating glass products are nominal values based on manufacturer's published test data for glass products 1-inch thick. U-values are expressed as BTU/hr. per sq. ft. per degree F. Apply coatings to heat-treated clear float glass of kind indicated or, if not otherwise indicated, Kind HS (heat strengthened) where recommended by manufacturer to comply with system performance requirements specified. Low E coating shall be applied to #2 surface of the insulated glass unit.

1. Sputter Coated Glass Products: Float glass with the following metallic coating applied by MSVD (magnetron sputtered vacuum deposition) after manufacture and heat treatment (if any). Pyrolytic, and wet chemical deposition, glass coatings will not be permitted.
2. Glazed Aluminum Curtain Walls and Aluminum-Framed Entrances and Storefronts Glass Products (Typical Vision):

    a. Maximum U Values (ASHRAE):

        1) Winter Night Time: 0.29 maximum.
        2) Summer Day Time: 0.27 maximum.

    b. Solar Heat Gain Coefficient, Maximum: 0.29.
    c. Visible Light Transmittance, Minimum: 49 percent.
    d. Visible Light Reflectance, Exterior, Maximum: 19 percent.
    e. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) Guardian Industries Corp.; SunGuard SN 54 (#2) Clear + Clear.
        2) Viracon; VNE1-53 Clear + Clear.
        3) Vitro; Solarban R67 (2) Clear + Clear.

3. Glazed Aluminum Curtain Walls and Aluminum-Framed Entrances and Storefronts Glass Products (Typical Vision)

    a. Maximum U Values (ASHRAE):

        1) Winter Night Time: 0.29 maximum.
        2) Summer Day Time: 0.27 maximum.

    b. Solar Heat Gain Coefficient, Maximum: 0.30.
    c. Visible Light Transmittance, Minimum: 52 percent.
    d. Visible Light Reflectance, Exterior, Maximum: 20 percent.
    e. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) Guardian Industries Corp.; SunGuard SN 54 (#2) UltraClear + UltraClear.
        2) Viracon; VNE1-53 Starphire + Starphire.
        3) Vitro; Solarban R67 (2) Starphire + Starphire.

2.8 GLAZING GASKETS

A. Dense Compression Gaskets: Continuous extruded silicone with cross sectional profile, physical properties and cross sectional fabrication tolerances as recommended by the glazing fabricator to comply with system performance requirements specified and in compliance with applicable provisions ASTM C1115.

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B. Soft Compression Gaskets: Continuous extruded, closed-cell, integral-skinned silicone gaskets complying with ASTM C509, Type II, [**black**][**gray**]<**insert color**>; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

C. Corners: Factory molded or sealed.

D. Continuous Structural Gaskets/Spacers: Continuous extruded silicone or silicone compatible rubber, with cross sectional profile, physical properties, and tolerances as recommended by the window and curtain wall manufacturer, and as required, to comply with the system performance requirements specified and shown. Gaskets/Spacers shall be tested for compatibility with silicone sealants and shall be subject to the acceptance of the sealant manufacturer.

2.9 GLAZING SEALANTS

A. General:

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

B. Sealant Types: As Specified in Division 07 Section "Joint Sealants".

C. Structural Glazing Sealant (**SE-01**): Neutral-curing structural silicone glazing sealant complying with ASTM C920 and ASTM C1184, Grade NS, Class 25 for Use NT.

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

a. Dow Corning Corporation; DOWSIL 983 for field use, and 995 or 121 for shop application.
b. GE Silicones; UltraGlaze SSG4600 for shop application and UltraGlaze SSG4000 for field application
c. Tremco; Proglaze SG.

2. Applications: For Structural Seals.

D. Weatherseal Glazing Sealant (**SE-02**): Low modulus, neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

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

a. Dow Corning Corporation; DOWSIL 790, 791 or 795.
b. GE Silicones; UltraGlaze SSG4000.
c. Tremco; Spectrem 2.

2. Applications: Weather seal.

E. Sealant for IGU secondary seals: Compliant with ASTM C1369, and ASTM C1249 Guidelines.

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2.10 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Silicone with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Silicone blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Silicone material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material) and Type C (Closed Cell), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance, complying with requirements specified in Division 07, Section "Joint Sealants".

2.11 FABRICATION OF GLAZING UNITS

A. Fabricate glass and glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with performance requirements.

1. Edge and Surface Conditions: Comply with the recommendations of AAMA "Structural Properties of Glass" for "clean-cut" edges, except comply with manufacturer's recommendations when they are at variance.

B. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

C. Cutting: Obtain sizes from shop drawings or field measurement. Cut lites to fit each opening with edge clearances and bite on glass as recommended by manufacturer. Do not nip glass edges.

1. Factory cut heavy float glass (1/2 inch and above). Edges may be wheel cut or sawed and seamed at manufacturer's option. For glass to be cut at site, provide glass larger than required to obtain, clean-cut edges without seaming or nipping.
2. Do not cut, seam, nip or abrade glass after heat-tempering. Before tempering glass, provide cutouts to receive hardware.

D. Edgework for Exposed Edges and Corners: Where edges of glass and corners are to be exposed in the finish work, provide polished edges and slightly eased arrises and eased corners. Where edges butt, provide flat polished and beveled edges.

E. Edges Concealed: Edges concealed in the finish work shall receive a flat ground finish, with edges free of blemishes, and square edges with slight chamfers at junctions of edges and faces.

F. Laminated Glass with Exposed Glass Edges: Zero tolerance and full alignment where exposed in the finish work.

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1. Laminated glass panels shall be rectified by polishing the edges prior to tempering to produce flush exposed laminated glass edges.

G. Laminated Glass with Concealed Glass Edges: Comply with reference standards for laminated glass edges concealed in the finish work.

1. Ground smooth and polish edges of laminated glass to be butt glazed. Ground smooth and slightly chamfer edges at glass edges to be concealed in the finish work.

H. Structural Glass Sloped Glazing Assemblies:

1. Fabricate glass and other glazing products in sizes indicated for Project, with edge and face clearances, edge and surface conditions, and bite, complying with recommendations of manufacturer and referenced glazing standard as required to comply with system performance requirements. All edgework, holes and notches shall be completed before any heat treatments.

2. Cutting Tolerances:

a. Dimensional tolerance on glass panel size shall be plus or minus 3 mm of the theoretical dimension required.
b. Squareness of each panel shall be within 4 mm.

I. Decorative Film Overlay: Apply squarely aligned to glass edges, uniformly smooth, and free from tears, air bubbles, wrinkles, and rough edges, in pattern indicated on Drawings to the back face of clean glass, according to manufacturer's written instructions, including surface preparation and application temperature limitations.

2.12 SOURCE QUALITY CONTROL

A. Provide insulating glass fabricator's quality control/quality assurance procedures and methods to control quality of finished insulating units, before units are packaged to leave the fabricator's site. Do not package or ship insulating glass units that are defective in hermetic seal, are warped, biased, exhibit any of the deterioration that are defined in Part I under "Definitions Article", Part 2 under "Coatings Article", or do not comply with requirements for a fully warranted product.

1. Lites will be inspected by the Installer and Contractor upon arrival and rejected lites will be returned for full replacement at the fabricator's cost.

B. Provide manufacturer's quality control/quality assurance procedures and methods to control warp and bow (As an alternate to methodology in paragraphs B. through E. of this Article). Provide certification that all heat- treated glass processes are conducted in manufacturing facilities with in-line equipment that provides testing and control of glass processes to provide uniform products without rollerwave distortions that are unacceptable to the design Architect. Items listed in paragraphs B. though E., of this section identify how this is controlled in the North and South American Continents.

C. Distortion Tolerance Testing: Measure in line, each pane of monolithic uncoated and coated heat-treated glass and coated glass of 6 mm thickness or more used on the Project Including visual mockups.

D. Roll Wave Criteria (Horizontal): Maximum Average 0.003 Center and 0.008 edges (peak to valley) per ASTM C1651 Standard for Test Measurement of Roll Wave Optical Distortion in Heat Treated Glass.

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E. Millidopter Criteria: (95% for pre-temperable coated and 90% for post-temperable coated surface) Maximum +/- 120A overall or highest overall measurement from the approved visual mock-up that is less than +/1 120 A overall, whichever is less.

F. Documentation

1. Document and record results for each pane.
2. Tag each pane of glass that falls outside the maximum distortion limits and certify that these non-conforming glass panels will not be fabricated and supplied to the project.
3. Provide written documentation of the Roller Wave and Millidiopter measurements of the glass used in visual mock-ups before the mock-ups are reviewed by the Owner and Architect for approval.
4. Bow/Warp Tolerance:

    a. 1/2 of ASTM C1048.
    b. Measure every hour on a vertical plane with a straight edge.
    c. Provide recorded written documentation upon request.
    d. Do not exceed maximum warpage in any direction.
    e. For uncoated glass comply with requirements for Condition A.
    f. For coated vision glass, comply with requirements for Condition C (other coated glass).

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

C. Inspect each piece of glass immediately before installation. Do not install any pieces which are improperly sized or have damaged edges, scratches or abrasion or other evidence of damage. Remove labels from glass immediately after installation.

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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. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

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 includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Place blocks to allow water passage to weep holes. Set blocks in thin course of compatible sealant suitable for heel bead.

1. Glass Units Less Than 6 ft. - 0 inches (1.8 m): Locate setting blocks at sill one - quarter of the width in from each end of the glass unless otherwise recommended by the glass manufacturer.
2. Glass Units 6 ft. - 0 inches (1.8 m) or Greater: Locate setting blocks at sill one - eighth of the width in from each end of the glass, but not less than 6 inches (150 mm), unless otherwise recommended by the glass manufacturer.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

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 true in line with uniform pattern, draw, bow, and similar characteristics.

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

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K. Set glass in locations indicated on Drawings. Install glass with hardware and accessories according to hardware manufacturer's written instructions. Attach hardware securely to mounting surfaces and building structure.

L. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

M. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

N. The installation of each lite of exterior glass shall be watertight, airtight, and capable of withstanding temperature changes, wind loading, and impact from operation (doors) without failure of any kind including loss or breakage of glass, failure of seal, exudation of sealant and excessive deterioration of glazing materials.

O. Film Application:

1. Clean glass surfaces thoroughly and install adhesive film in strict compliance with manufacturer's instructions.
2. Cut film edges neatly and square at a uniform distance of 1/8 inch to 1/16 inch of glass edges. Replace blade tips after 3 to 4 cuts, for a crisp straight edge.
3. Spray manufacturer recommended slip solution on glass and adhesive to facilitate proper positioning of film.
4. Apply film to glass and lightly spray film with slip solution.
5. Squeegee from top to bottom of each pane of glass receiving adhesive film. Spray slip solution to film and squeegee a second time.
6. Bump film edge with lint-free towel wrapped around edge of a manufacturer recommended 5-way tool.
7. Upon completion of film application, allow 30 days for curing film, allowing moisture from film installation to dry thoroughly, and allow film to dry flat without moisture dimples when viewed under normal viewing conditions.

P. Entrance Glass/Visual Distraction Marks: Provide window and door distraction markings on glass surfaces, in colors, uniform patterns and spacing shown. Coordinate with Architect for custom graphics on interlayers to produce visual distraction markings complying with requirements.

1. Where interlayers are not used, provide applied graphics to comply with referenced standards.

3.4 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Field vulcanize corner joints of gaskets. Where installation procedures do not permit field vulcanizing, miter cut glazing gaskets at corner joints and join with a sealant recommended by the gasket manufacturer which will provide an airtight and watertight seal at the joint.

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D. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

F. 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.

D. Structurally Glazed Insulating Glass Units: Set full length continuous structural gaskets/spacers to framing members of the window and curtain wall systems. Set glass units with void between edge of units and framing members, but with units fully within framing member rebate so as to provide a minimum 1/2-inch bite. Align glass unit edges over framing members continuous structural gasket/spacers and secure with manufacturers recommended temporary cleats. Structurally seal glass unit to framing members with specified one-part structural silicone sealant to provide a minimum 1/4 by 1/4-inch bead of sealant. Tool structural silicone perpendicular to face of interior glass light; remove excess structural silicone from glass and metal substrates. After full cure of structural silicone sealant remove temporary cleats. Any holes left in the framing members which were caused by the temporary cleats shall be sealed immediately.

E. The installation of each light of exterior glass shall be watertight, airtight, and capable of withstanding temperature changes, wind loading, and impact from operation (doors) without failure of any kind including loss or breakage of glass, failure of seal, exudation of sealant and excessive deterioration of glazing materials.

F. Glazed Monolithic and Laminated Glass Units (Butt Glazing): Glass to glass glazing shall be in accordance with the recommendations of sealant and glass manufacturers and shall include the following.

1. Mask both sides of each adjacent piece of glass to be glazed.
2. Provide wood dowel, with a diameter of at least 3 times of the joint width, wrapped in polyethylene and firmly taped to interior face of glass to act as a back-up during glazing operations.
3. Tool face of sealant slightly concave using extreme care not to chip or otherwise abrade corners of glass.

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4. Allow sealant to fully cure before removing wood polyethylene wrapped dowel.

3.6 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations.

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 buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
2. Remove and replace glass that cannot be cleaned without damage to coatings.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or otherwise damaged during construction period.

E. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.7 GLASS SCHEDULE, GENERAL REQUIREMENTS

A. Fabrication Engineering: Provide the following glass types at general locations indicated below and at locations shown on drawings. Glass thickness and heat treatment values below are minimum selected by Architect for detailing purposes. Provide thicker glass lites and heat treatments necessary for each condition of use to comply with ASTM E1300, performance requirements and Division 08 Section "Exterior Enclosure Requirements".

1. Thicker heat strengthened glass or laminated glass lites which comply with required performance may be proposed in lieu of thinner fully tempered glass at glass panels not adjacent to walking surfaces where fully tempered glass is specified.

B. Material Colors:

1. Glass Dual Seal at spacer bar: Black.
2. Silicone Gasket and Silicone Weather Seal Color: Black.
3. Frit Color: As indicated.
4. Spandrel Flood Coat Color: As indicated.

3.8 EXTERIOR GLASS SCHEDULE

A. Glass Type **GL-01**: Insulating Vision Glass Unit (Typical Curtain Walls, Entrances, and Storefronts).

1. Outboard Lite: 6 mm thick heat strengthened low-iron (ultraclear) glass with Low-E coating on #2 surface.
2. Air Space: 13 mm thick.
3. Inboard Lite: 6 mm thick heat-strengthened low-iron (ultraclear) glass.
4. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

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a. Guardian Industries Corp.; SunGuard SN 54 (#2) UltraClear + UltraClear.
b. Viracon; VNE1-53 Starphire + Starphire.
c. Vitro; Solarban R67 (2) Starphire + Starphire.

B. Glass Type **GL-01A**: Insulating Vision Glass Unit (Typical Curtain Walls, Entrances, and Storefronts – Safety Glazing).

1. Outboard Lite: 6 mm thick fully thermally tempered low-iron (ultraclear) glass with Low-E coating on #2 surface.
2. Air Space: 13 mm thick.
3. Inboard Lite: 6 mm thick fully thermally tempered low-iron (ultraclear) glass.
4. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Guardian Industries Corp.; SunGuard SN 54 (#2) UltraClear + UltraClear.
b. Viracon; VNE1-53 Starphire + Starphire.
c. Vitro; Solarban R67 (2) Starphire + Starphire.

C. Glass Type **GL-02**: Not Used.

D. Glass Type **GL-03**: Not Used.

E. Glass Type **GL-04**: Insulating Laminated Vision Glass Unit (Curtain Walls, Entrances, and Storefronts).

1. Outboard Lite: 6 mm thick heat strengthened low-iron (ultraclear) glass.
2. Interlayer: 1.5 mm thick clear polyvinyl butyral sheet.
3. Outboard Lite: 6 mm thick heat strengthened low-iron (ultraclear) glass with Low-E coating on #4 surface.
4. Air Space: 13 mm thick.
5. Inboard Lite: 6 mm thick heat-strengthened low-iron (ultraclear) glass.
6. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Guardian Industries Corp.; SunGuard SN 54 (#2) UltraClear + UltraClear.
b. Viracon; VNE1-53 Starphire + Starphire.
c. Vitro; Solarban R67 (2) Starphire + Starphire.

F. Glass Type **GL-04A**: Insulating Laminated Vision Glass Unit (Curtain Walls, Entrances, and Storefronts – Safety Glazing).

1. Outboard Lite: 6 mm thick heat strengthened low-iron (ultraclear) glass.
2. Interlayer: 1.5 mm thick clear polyvinyl butyral sheet.
3. Outboard Lite: 6 mm thick heat strengthened low-iron (ultraclear) glass with Low-E coating on #4 surface.
4. Air Space: 13 mm thick.
5. Inboard Lite: 6 mm thick fully thermally tempered low-iron (ultraclear) glass.
6. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Guardian Industries Corp.; SunGuard SN 54 (#2) UltraClear + UltraClear.
b. Viracon; VNE1-53 Starphire + Starphire.
c. Vitro; Solarban R67 (2) Starphire + Starphire.

G. Glass Type **GL-05**: Insulating Laminated Vision Glass Unit (Curtain Walls, Entrances, and Storefronts).

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1. Outboard Lite: 6 mm thick heat strengthened low-iron (ultraclear) glass with Low-E coating on #2 surface.
2. Air Space: 13 mm thick.
3. Inboard Lite: 6 mm thick heat-strengthened low-iron (ultraclear) glass.
4. Interlayer: 1.5 mm thick clear polyvinyl butyral sheet.
5. Inboard Lite: 6 mm thick heat-strengthened low-iron (ultraclear) glass.
6. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Guardian Industries Corp.; SunGuard SN 54 (#2) UltraClear + UltraClear.
    b. Viracon; VNE1-53 Starphire + Starphire.
    c. Vitro; Solarban R67 (2) Starphire + Starphire.

H. Glass Type **GL-05A**: Insulating Laminated Vision Glass Unit (Curtain Walls, Entrances, and Storefronts – Safety Glazing).

1. Outboard Lite: 6 mm thick fully thermally tempered low-iron (ultraclear) glass with Low-E coating on #2 surface.
2. Air Space: 13 mm thick.
3. Inboard Lite: 6 mm thick heat strengthened low-iron (ultraclear) glass.
4. Interlayer: 1.5 mm thick clear polyvinyl butyral sheet.
5. Inboard Lite: 6 mm thick heat strengthened low-iron (ultraclear) glass.
6. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Guardian Industries Corp.; SunGuard SN 54 (#2) UltraClear + UltraClear.
    b. Viracon; VNE1-53 Starphire + Starphire.
    c. Vitro; Solarban R67 (2) Starphire + Starphire.

I. Glass Type **GL-06**: Laminated Spandrel Glass Unit (Glass Curtains).

1. Outboard Lite: 6 mm thick fully thermally tempered low-iron (ultraclear) glass.
2. Interlayer: 1.5 mm thick clear ionoplast sheet.
3. Inboard Lite: 6 mm thick fully thermally tempered low-iron (ultraclear) glass with custom color ceramic coating on #4 surface.
4. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Guardian Industries Corp.; UltraClear + UltraClear.
    b. Viracon; Starphire + Starphire.
    c. Vitro; Starphire + Starphire.

5. Basis-of-Design for Ceramic Coating: Subject to compliance with requirements, provide the following product or a comparable product by another qualified manufacturer:

    a. Viracon; Viraspan Laminated Spandrel Glass.

        1) Viracon Ceramic Coating: V955, Black.

J. Glass Type **GL-07**: Laminated Vision Glass Unit (Sloped Glazing Assemblies).

1. Top Lite: 10 mm thick fully thermally tempered clear glass.
2. Interlayer: 1.5 mm thick clear ionoplast.
3. Bottom Lite: 10 mm thick fully thermally tempered clear glass with ceramic frit pattern coating on #4 surface.

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4. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Guardian Industries Corp.; UltraClear + UltraClear.
    b. Viracon; Starphire + Starphire.
    c. Vitro; Starphire + Starphire.

5. Basis-of-Design for Ceramic Fit Pattern: Subject to compliance with requirements, provide the following product or a comparable product by another qualified manufacturer:

    a. Viracon; Starphire + Starphire, Silkscreen.

        1) Viracon Screen No.: Screen #2002 (#4) (Horizontal Lines, 50% Coverage).
        2) Viracon Color No.: Viraspan High-Opacity White V175 (#2) (White).

K. Glass Type **GL-08**: Laminated Vision Glass Unit (Structural Glass Railing).

1. Outboard Lite: 6 mm thick fully thermally tempered low-iron (ultraclear) glass.
2. Interlayer: 1.5 mm thick clear ionoplast sheet.
3. Inboard Lite: 6 mm thick fully thermally tempered low-iron (ultraclear) glass.
4. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Guardian Industries Corp.; UltraClear + UltraClear.
    b. Viracon; Starphire + Starphire.
    c. Vitro; Starphire + Starphire.

3.9 INTERIOR GLASS SCHEDULE

A. Glass Type **GL-11**: Monolithic Vision Glass Unit (All-Glass Entrances and Storefronts)

1. Lite: 12 mm thick fully thermally tempered low-iron (ultraclear) glass.
2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Guardian Industries Corp.; UltraClear.
    b. Viracon; Starphire.
    c. Vitro; Starphire.

B. Glass Type **GL-12**: Monolithic Vision Glass Unit (Butt Glazed Glass)

1. Lite: 12 mm thick fully thermally tempered low-iron (ultraclear) glass.
2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Guardian Industries Corp.; UltraClear.
    b. Viracon; Starphire.
    c. Vitro; Starphire.

C. Glass Type **GL-13**: Monolithic Vision Glass Unit (Interior Glass Doors and Glass Shelves)

1. Lite: 12 mm thick fully thermally tempered low-iron (ultraclear) glass.
2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

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a. Guardian Industries Corp.; UltraClear.
b. Viracon; Starphire.
c. Vitro; Starphire.

D. Glass Type **GL-23**: Laminated Vision Glass Unit (Structural Glass Railing).

1. Outboard Lite: 10 mm thick fully thermally tempered low-iron (ultraclear) glass.
2. Interlayer: 1.5 mm thick clear ionoplast sheet.
3. Inboard Lite: 10 mm thick fully thermally tempered low-iron (ultraclear) glass.
4. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Guardian Industries Corp.; UltraClear + UltraClear.
b. Viracon; Starphire + Starphire.
c. Vitro; Starphire + Starphire.

END OF SECTION

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SECTION 089000 - LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Formed louvers with finish to match metal panels.
2. Fixed, extruded-aluminum louvers.
3. Blank-off panels for louvers.
4. Bird screens for louvers.

C. Related Requirements:

1. Division 07 Section “Formed Metal Wall Panels” for coordination of louver type with metal panel profile.

1.2 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

C. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven-rain performance, as determined by testing in accordance with AMCA 500-L.

1.3 SUBMITTALS

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

B. Sustainable Design Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

    a. Include statement indicating costs for each product having recycled content.

2. Product Data for Credit MR 5: For products that are extracted, processed, and manufactured regionally, documentation indicating the distance from the location of raw material extraction, harvest, or recovery to Project and from the location of manufacture to Project for each product.

    a. Include statement indicating costs for each product having regional content.
    b. For steel products include statement indicating sourced location or radius from steel mill of scrap/furnace charge material.

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C. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing. Show unit dimensions related to wall openings and construction; free area for each size indicated; profiles of frames at heads, jambs, and sills; and anchorage details and locations.

1. For installed louvers indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation and licensed in the State of Florida.

D. Samples for Verification: Submit sets of samples for each finish and color required. Sample finishes shall be on the specified alloy temper, and thickness of metal required for the work; on 12-inch lengths of extrusion or 12-inch squares of sheet or plate sets; and shall show the maximum range or variation in color and shade, in not less than 4 samples per set.

E. Qualification Data: For professional engineer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver.

G. Certificates: Submit product certificates signed by louver manufacturers certifying that their products which comply with Project requirements are licensed to bear AMCA Seal based on tests made in accordance with AMCA Standard 511 and complying with AMCA Certified Ratings Program.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2, "Structural Welding Code--Aluminum."

C. Welding Certification: Certify that each welder employed in unit of Work of this section has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1. Testing for recertification is Contractor's responsibility.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify louver openings 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 opening dimensions and proceed with fabricating louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

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1.6 PROJECT CONDITIONS

A. General: Comply with the applicable provisions of AAMA "Curtain Wall Manual #10" for the care and handling of architectural aluminum from shop to site.

B. All louver components shall be identified after fabrication by marks clearly indicating their location on the building. Packaging of components shall be so selected to protect the components from damage during shipping and hoisting.

C. Storage on Site:

1. Store louver components in a location and in a manner to avoid damage to the components. Stacking shall be done in a way which will prevent bending, excessive pressure, abrasion or other permanent damage of the component and its finished surfaces.
2. Store aluminum components and materials in a clean, dry location, away from uncured concrete and masonry and other construction activities. Cover with non-staining waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.

D. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of metals.

1.7 WARRANTY

A. General: The Warranties submitted under this Section shall not deprive the Owner of other action, right or remedy that the Owner may have under other provisions of the Contract Documents and is in addition to and runs concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Warranty for Louvers located in the Exterior Wall: Submit a 5 year written warranty, beginning from date of final completion, executed by the Contractor and the window wall subcontractor, agreeing to repair or replace any component of the louver work that develops defects in materials or workmanship within the specified warranty period. Defects include structural failure, sealant failure, uncontrolled water leakage, deterioration of metal finishes beyond normal weathering, failure of operating parts to function properly, and any other evidence of failure or deterioration of the louver work to meet performance requirements.

C. Warranty for High Performance Organic Coatings: Submit a warranty for a period of twenty (20) years, warranting the integrity of film and permanence of color of the high performance organic coatings for the following:

1. Color fade not to exceed 5 delta E units (Hunter) as calculated in accordance with ASTM D2244 on exposed surfaces cleaned with clean water and a soft cloth.
2. Degree of chalking not to exceed rating No. 8 when measured in accordance with ASTM D4214 on exposed unwashed surfaces.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Removability: Select louvers shall be engineered to be installed with mechanisms and connections to allow panels to be removable to accommodate equipment replacement.

B. Structural Performance: Provide louvers capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act on vertical projection of louvers.

1. Wind Loads: As indicated on Drawings.
2. Deflection Limitations:

    a. Deflection Limitations: Base calculations for the following deflections upon the combination of maximum direct wind loadings, building deflections, thermal stresses, and erection tolerances.

        1) The deflection of any framing member in a direction normal to the plane of the wall when subjected to the full code required wind loads specified above shall not exceed 1/175 of its clear span or 3/4-inch whichever is less.
        2) Sealants and interior finishes shall not be included to contribute to framing member strength, stiffness, or lateral stability.

    b. Do not permit any permanent deformation (set) in the aluminum framing work. Permanent deformation, fastener, weld, or gasket failure, component breakage or disengagement shall not occur under wind loading equal to 1.5 times the wind loads (positive or negative). Permanent deformation shall be taken as deflection without recovery exceeding 1/1000 times span.

C. Thermal Movements: Provide louvers 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 degrees F, ambient; 180 degrees F, material surfaces.

D. Building Movements: Provide louvers that allow for building movements resulting from the thermal movements, loading deflections, shrinkage, creep, and similar movements. Thermal movements shall be as specified above. Building frame deflections, shrinkage, creep, and other movements are available from the Design Professional.

E. Air-Performance, Water-Penetration, Air-Leakage, and Wind-Driven Rain Ratings: Provide louvers complying with performance requirements indicated, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1. AMCA Seal: Mark units with the AMCA Certified Ratings Seal.

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F. Design Modifications:

1. Submit design modifications necessary to meet the performance requirements and field coordination.
2. Variations in details or materials shall not adversely affect the appearance, durability, or strength of components.
3. Maintain the general design concept without altering size of members, profiles, and alignment.

2.2 LV-01: FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Construction Specialties.
   b. Greenheck.
   c. Ruskin.

B. Horizontal, Drainable-Blade Louver: Drainable-blade louver with blade gutters and mullions capable of collecting and draining water from blades.

1. Louver Depth: 6-inches.
2. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.080-inch.
3. Mullion Type: Exposed.
4. Performance Requirements:

   a. Free Area: Not less than 7.8-sq. ft. for 48-inch wide by 48-inch high louver.
   b. Point of Beginning Water Penetration: Not less than 850 fpm.
   c. Air Performance: Not more than 0.10-inch w.g. static pressure drop at 850 fpm free-area velocity.

2.3 LOUVER SCREENS

A. General: Provide removable screens at each exterior louver, sized to cover the entire opening, except where blank-off panels are required.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening.

B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6-inches from each corner and at 12-inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Formed or extruded aluminum. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Rewirable frames with a driven spline or insert for securing screen mesh.

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D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Aluminum, 1/2-inch square mesh, 0.063-inch wire.

2.4 BLANK-OFF PANELS

A. Insulated, Blank-off Panels: Laminated metal-faced panels consisting of insulating core surfaced on back and front with metal sheets.

1. Thickness: 3-inches.
2. Metal Facing Sheets: Aluminum sheet, not less than 0.063-inch nominal thickness.
3. Insulating Core: Insulating Core: Extruded-polystyrene insulation board complying with ASTM C578, Type VII 2.2-lb./cu. ft. density.
4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness, with corners mitered and with same finish as panels.
5. Seal perimeter joints between panel faces and louver frames with 1/8-by-l-inch compression tape gaskets.
6. Panel Finish: Same type of finish applied to louvers, but matte black color.
7. Attach blank-off panels to back of louver frames with stainless-steel, sheet metal screws.

2.5 MATERIALS

A. Aluminum: Conform to the requirements published in AA "Aluminum Standards and Data", referenced ASTM standards, and the following. All aluminum extrusions shall be manufactured to dimensional tolerances not exceeding 1/2 of those published in the applicable sections of AA publication "Aluminum Standards and Data".

1. Alloys for Extruded Bars, Rods, Shapes and Tubes: AA Alloy 6063 and ASTM B221 with tempering as required to suit performance requirements and finishes specified. Provide concealed extruded bars, rods, shapes, and tubes in alloys as recommended by the fabricator to join or reinforce assembly of exposed aluminum components.
2. Alloys for Sheet and Plate: AA Alloy 5005 and ASTM B209 with tempering as required to suit performance requirements and finishes specified.
3. Welding Rods and Bare Electrodes: AWS A5.10.
4. Shapes and Thickness: Provide shapes as shown and as required to suit the performance requirements.

B. Carbon Steel Components: For carbon steel components required to join, reinforce, or support the assembly of aluminum components provide carbon steel conforming to the following standards:

1. Structural Steel Shapes, Plates and Bars: ASTM A36/A36M; hot dip galvanized, complying with ASTM A123.

C. Fasteners: 300 Series stainless steel. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use Phillips flat-head screws for exposed fasteners, with color to match adjacent surfaces.

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D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.

E. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

2.6 FABRICATION, GENERAL

A. General: Provide louvers and accessories of design, materials, sizes, depth, arrangement shown, and metal thicknesses specified and as required for optimum performance with respect to airflow, water penetration, air leakage, durability, structural integrity, expansion and contraction control, and uniform appearance.

B. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.

D. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

E. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel, unless otherwise indicated.

F. Include supports, anchorages, and accessories required for complete assembly.

G. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer or required by wind loads, or 60 inches o.c., whichever is less.

1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

H. Provide sill extensions and loose sills made of same material as louvers where indicated or required for drainage to exterior and to prevent water penetrating to interior.

I. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

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2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish louvers after assembly.

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic-Coating Finish: Complying with AAC12R1X and the following:

1. Extrusions and Preformed Aluminum Metal Shapes: Polyvinylidene fluoride finish coating containing not less than 70% of "ATO Atochem Kynar 500" or "Ausimont Hylar 5000" fluorocarbon resin specially formulated for spray application to extrusions and preformed aluminum metal shapes. Remove die markings, scratches, abrasions, dents, and other blemishes before applying finish. Coating films shall be uniform and visibly free from flow lines, streaks, blisters, sags, or other surface imperfections in the dry-film state on all surfaces.

    a. Metal Preparation and Pretreatment: Pretreatment of aluminum surface and application of the finish shall be performed under specifications issued by the licensed formulator to approved applicator and the following as a minimum:

        1) The products used to form the chemical conversion coating on aluminum extrusions shall conform with ASTM D1730, Type B, Method 5 (Amorphous Chromium Phosphate Treatment) or Method 7 (Amorphous Chromate Treatment).
        2) The coating weight of the chemical conversion coating shall be a minimum of 40 mg. per sq. ft. on exposed surfaces as specified in ASTM B449, Section 6, Class I. Processing shall conform with that specified in ASTM B449, Section 5.

    b. Thickness, Two Coat System: Minimum 1.2-mil total dry film thickness (0.25-mil primer +/- 0.05-mil, 1.0-mil color coat.
    c. Touch-Up Finish: Polyvinylidene fluoride finish coating, containing fluorocarbon resin and formulated for air-drying at ambient temperature. Provide for field touch-up and furnish in color to match shop-applied finishes.
    d. Coating Performance Criteria: Meeting or exceeding AAMA 2605.
    e. Color and Finish to match color of metal panel (**MP-1**).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 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.

3.3 INSTALLATION

A. General: Erect louver components in accordance with the manufacturer's written instructions and recommendations.

B. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

C. Use concealed anchorages where possible. Provide neoprene washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

D. Form closely fitted joints with exposed connections accurately located and secured.

E. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

F. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

G. 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.

H. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

I. Flashing: Refer to Division 07 Section “Sheet Metal Flashing and Trim”.

3.4 PROTECTION AND CLEANING

A. Protect louvers from damage of any kind during construction period including use of temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at time of Final Completion.

1. Cleaning and protective methods shall be carefully selected, applied, and maintained so that finishes will not become uneven or otherwise impaired as a result of unequal exposure to light and weathering conditions.

B. Periodically clean exposed surfaces of louvers that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

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D. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units, and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089000

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SECTION 089200 - LOUVERED EQUIPMENT ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Louvered aluminum screens for concealing equipment.
2. Sliding gates for access to equipment.

C. Related Requirements:

1. Division 05 Section “Metal Fabrications” for superstructure support and bracing of screens.

1.2 REFERENCE STANDARDS

A. AAMA:

1. AAMA 2604 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
2. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. ASTM:

1. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
2. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Storage and handling requirements and recommendations.
2. Installation methods.

B. Shop Drawings: Include plans, sections, and details of connections and bracing.

1. Include structural calculations indicating compliance with wind loading requirements.
2. Show field measurements on shop drawings.

C. Fabrication Engineering and Design: For louvered equipment screens indicated to comply with performance requirements, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

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1. Include calculations supporting engineering design decisions.
2. Show types, connections, types of reinforcement, types of assembly stiffeners, and other aspects of structural engineering. Indicate location, type, magnitude, and direction of loads imposed on supporting site elements.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available finishes, colors, and textures.

1. Verification Samples: For each product specified, two samples, minimum size 8 inches (200 mm) square or long, as appropriate, representing actual product configuration, color, and texture.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Qualification Statement.

B. Fabricator/Installer’s Qualification Statement.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than ten years of documented experience.

B. Fabricator/Installer Qualifications: Company specializing in fabricating and installing enclosures of the type specified in this section, with not less than three years of documented experience.

1.6 FIELD CONDITIONS

A. Field Measurements: Take field measurements prior to fabrication of the work and preparation of shop drawings, to ensure proper fitting of the work. Show recorded measurements on final shop drawings. Notify the Owner and the Architect, in writing, of any dimensions found which are not within specified dimensions and tolerances in the Contract Documents, prior to proceeding with the fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project site in supplier’s or manufacturer’s original wrappings and containers, labeled with supplier’s or manufacturer’s name, material or product brand name, and lot number, if any.

B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

C. Comply with manufacturer's instructions for handling of screen products.

1.8 WARRANTY

A. See Division 01 Section “Closeout Procedures”, for additional warranty requirements.

B. Submit manufacturer's standard ten-year finish warranty.

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PART 2 - PRODUCTs

2.1 DESIGN CRITERIA

A. Fabrication Engineering and Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements." Provide a comprehensive engineering analysis based on design criteria and performance requirements indicated.

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of authorities having jurisdiction. Obtain necessary approvals from such authorities.

B. Structural Performance: Provide louvered equipment enclosure and gate system capable of withstanding the effects of applicable loads and stresses within limits and under conditions indicated. Performance shall include, but shall not be limited to, applicable hardware components, etc.

2.3 MANUFACTURERS

A. Louvered Equipment Enclosures and Sliding Gates:

1. Airline Louvers.
2. American Warming and Ventilating.
3. Industrial Louvers, Inc.
4. Ruskin Company.
5. Firm selected by Fabricator/Installer.

2.4 ROLL-FORMED HORIZONTAL LOUVERS

A. Construction: Individual roll-formed aluminum louvers with blade supports attached to custom aluminum frames.

B. Louver Blades: Alloy 6063-T5 or T6 temper, or equivalent in accordance with ASTM B221M, 0.060 inch (1.5 mm) thick, 1.14 inches (29 mm) deep, 1.5 inches (38 mm) spacing, and configured to totally block sightlines.

C. Frame: Manufacturer's standard 1.57 inches (40 mm) square extruded tubing; 0.079 inch (2 mm) thick.

D. Aluminum Finish: Factory finish louvers and accessories with a high-performance organic coating, as follows:

1. Organic Coating: Clean and prime exposed aluminum surfaces and apply a fluoropolymer two-coat finish complying with AAMA 2605, with a minimum dry film thickness (DFT) of 1.2 mil.
2. Color: To match existing KAUST campus louvers, and approved by Architect and Owner.

E. Overall Screen Configuration: Dimensions, details, and layout as indicated on Drawings.

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2.5 DOUBLE SWING GATES

A. Configuration:

1. Swing: As indicated on Drawings.

B. Gate Frames:

1. Two (2) horizontal tubes and two (2) vertical tubes, 2 inches x 2 inches (50.8 mm x 50.8 mm) 11 gauge (3.0 mm) square tubes, welded at intersections to create a rigid frame, in accordance with ASTM F900.

C. Gate Posts:

1. Match line posts.

2.6 SWINGING GATES HARDWARE:

A. Standard Hardware: Hot-dip galvanized steel in conformity with ASTM F900, sized to assure proper gate operation. Powder coat non- moving parts.

B. Hinges: BHMA A156.1, Grade 1, suitable for exterior use.

1. Function: 39 - Full surface, triple weight, antifriction bearing.
2. Material: Wrought steel, forged steel, cast steel, or malleable iron; galvanized.

C. Rim Locks: BHMA A156.5, Grade 1, suitable for exterior use.

1. Function: 626 - Interlocking deadbolt operated by key from either side.
2. Material: Cast, forged, or extruded brass or bronze.
3. Mounting Plate: Configuration necessary for mounting locks. Fabricate from 1/8-inch- (3.2-mm-) thick, steel plate; hot-dip galvanize after fabrication.

D. Latches: Self latching clamp-on gravity systems permitting operation from both sides of gate.

E. Keepers: For each gate leaf more than 5 feet (1.52 m) wide.

F. Cane Bolts: Provide for inactive leaf of pairs of gates. Fabricated from 1/2-inch- (12.7-mm-) diameter, round steel bars, hot-dip galvanized after fabrication. Finish to match gates. Provide galvanized-steel pipe strikes to receive cane bolts in both open and closed positions.

G. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.

2.7 SLIDING GATES

A. Construction: Custom assembly of aluminum extrusions and wheeled trolleys.

B. Configuration: Configure each gate leaf as a single panel, constructed with frame matching fixed enclosure panels.

C. Size: As indicated on Drawings.

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D. Top and Bottom Rails: Manufacturer's standard H-shape extrusion shaped and sized to accept the louvered frame at one opening and sliding hardware assembly at the other opening.

E. Sliding Hardware Assemblies: Provide at top and bottom.

1. Trolleys: Selected by Fabricator for project application.

a. Wheels: 1.18 inches (30 mm) diameter, minimum.

F. Tracks: Aluminum.

2.8 ACCESSORIES

A. Miscellaneous Trim: Aluminum sheet, alloy 3005-H25 temper, or equivalent in accordance with ASTM B209/B209M, formed to shapes indicated and finished to match other components.

B. Support Structure: As indicated on Drawings.

C. Fasteners: Self-tapping stainless steel screws, as recommended and approved by fabricator of equipment screens.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install equipment screens in accordance with manufacturer's printed instructions and as indicated on shop drawings.

B. Form tight joints and fit exposed connections accurately.

C. Provide necessary fastenings and anchors required for a complete installation, and install units plumb, level, and in proper alignment with adjacent work.

3.4 PROTECTION

A. Protect installed products until completion of project.

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B. Protect metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry or dissimilar metals.

C. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 089200

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SECTION 090561.13 - MOISTURE VAPOR EMISSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Fluid-applied, resin-based, membrane-forming systems that control the moisture-vapor-emission rate of high-moisture, interior concrete to prepare it for floor covering installation. Product may be used at subcontractor's option in the event sufficient drying of slabs has not occurred when flooring installation is planned.

1.2 DEFINITIONS

A. MVE: Moisture vapor emission.

B. MVER: Moisture vapor emission rate.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For coatings, indicating VOC content.
2. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sustainable Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
3. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

C. Product Test Reports: For each MVE-control system, for tests performed by a qualified testing agency.

1. Product Data: For coatings, indicating VOC content.

D. Preinstallation testing reports.

E. Field quality-control reports.

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1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Employs factory-trained personnel who are available for consultation and Project-site inspection.

B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating directions for storage and mixing with other components.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Comply with MVE-control system manufacturer's written instructions for substrate and ambient temperatures, humidity, ventilation, and other conditions affecting system installation.

1. Store system components in a temperature-controlled environment and protected from weather and at ambient temperature of not less than 65 deg F (18 deg C) and not more than 85 deg F (29.4 deg C) at least 48 hours before use.
2. Maintain ambient temperature and relative humidity in installation areas within range recommended in writing by MVE-control system manufacturer, but not less than 65 deg F (18 deg C) or more than 85 deg F (29.4 deg C) and not less than 40 or more than 60 percent relative humidity, for 48 hours before installation, during installation, and for 48 hours after installation unless longer period is recommended in writing by manufacturer.
3. Install MVE-control systems where concrete surface temperatures will remain a minimum of 5 deg F (3 deg C) higher than the dew point for ambient temperature and relative humidity conditions in installation areas for 48 hours before installation, during installation, and for 48 hours after installation unless longer period is recommended in writing by manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. MVE-Control System Capabilities: Capable of suppressing MVE without failure where installed on concrete that exhibits the following conditions:

1. MVER: Maximum 15 lb of water/1000 sq. ft. (6.80 kg of water/92.9 sq. m) when tested according to ASTM F1869.
2. Relative Humidity: Maximum 90 percent when tested according to ASTM F2170 using in situ probes.

B. Water-Vapor Transmission: Through MVE-control system, maximum 0.06 perm (3.45 ng/Pa x s x sq. m) when tested according to ASTM E96/E96M.

C. Tensile Bond Strength: For MVE-control system, greater than 200 psi (1.38 MPa) with failure in the concrete according to ASTM D7234.

D. Low-Emitting Materials:

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1. Adhesives and Sealants wet-applied on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. All adhesives and sealants wet-applied onsite must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4/v4.1 BD+C: New Construction".

2.2 MVE-CONTROL SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ARDEX Americas.
2. BASF Corp. - Construction Chemicals.
3. LATICRETE SUPERCAP, LLC.
4. MAPEI Corporation.

B. MVE-Control System: ASTM F3010-qualified, fluid-applied, two-component, epoxy-resin, membrane-forming system; formulated for application on concrete substrates to reduce MVER to level required for installation of floor coverings indicated and acceptable to manufacturers of floor covering products indicated, including adhesives.

1. Substrate Primer: Provide MVE-control system manufacturer's concrete-substrate primer if required for system indicated by substrate conditions.
2. Cementitious Underlayment Primer: If required for subsequent installation of cementitious underlayment products, provide MVE-control system manufacturer's primer to ensure adhesion of products to MVE-control system.

2.3 ACCESSORIES

A. Patching and Leveling Material: Moisture-, mildew-, and alkali-resistant product recommended in writing by MVE-control system manufacturer and with minimum of 3000-psi (20.68-MPa) compressive strength after 28 days when tested according to ASTM C109/C109M.

B. Crack-Filling Material: Resin-based material recommended in writing by MVE-control system manufacturer for sealing concrete substrate crack repair.

C. Cementitious Underlayment: If required to maintain manufacturer's warranty, provide MVE-control system manufacturer's hydraulic cement-based underlayment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of system indicates acceptance of surfaces and conditions.

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3.2 PREPARATION

A. Preinstallation Testing:

1. Testing Agency: Owner will engage a qualified testing agency to perform tests.
2. Alkalinity Testing: Perform pH testing according to ASTM F710. Install MVE-control system in areas where pH readings are less than 7.0 and in areas where pH readings are greater than 8.5.
3. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F1869. Install MVE-control system in locations where concrete substrate MVER exceeds 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    b. Internal Relative Humidity Test: Using in situ probes, ASTM F2170. Install MVE-control system in locations where concrete substrates exhibit relative humidity level greater than 75 percent.

4. Tensile-Bond-Strength Testing: For typical locations indicated to receive installation of MVE-control system, install minimum 100-sq. ft. (9.29-sq. m) area of MVE-control system to prepared concrete substrate and test according to ASTM D7234.

    a. Proceed with installation only where tensile bond strength is greater than 200 psi (1.38 MPa) with failure in the concrete.

B. Concrete Substrates: Prepare and clean substrates according to MVE-control system manufacturer's written instructions to ensure adhesion of system to concrete.

1. Remove coatings and other substances that are incompatible with MVE-control system and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by MVE-control system manufacturer. Do not use solvents.
2. Provide concrete surface profile complying with ICRI 310.2R CSP 3 by shot blasting using apparatus that abrades the concrete surface with shot, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
3. After shot blasting, repair damaged and deteriorated concrete according to MVE-control system manufacturer's written instructions.
4. Protect substrate voids and joints to prevent resins from flowing into or leaking through them.
5. Fill surface depressions and irregularities with patching and leveling material.
6. Fill surface cracks, grooves, control joints, and other nonmoving joints with crack-filling material.
7. Allow concrete to dry, undisturbed, for period recommended in writing by MVE-control system manufacturer after surface preparation, but not less than 24 hours.
8. Before installing MVE-control systems, broom sweep and vacuum prepared concrete.

C. Protect walls, floor openings, electrical openings, door frames, and other obstructions during installation.

3.3 INSTALLATION

A. General: Install MVE-control system according to ASTM F3010 and manufacturer's written instructions to produce a uniform, monolithic surface free of surface deficiencies such as pin holes, fish eyes, and voids.

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1. Install primers as required to comply with manufacturer's written instructions.

B. Do not apply MVE-control system across substrate expansion, isolation, and other moving joints.

C. Apply system, including component coats if any, in thickness recommended in writing by MVE-control system manufacturer for MVER indicated by preinstallation testing.

D. Cure MVE-control system components according to manufacturer's written instructions. Prevent contamination or other damage during installation and curing processes.

E. After curing, examine MVE-control system for surface deficiencies. Repair surface deficiencies according to manufacturer's written instructions.

F. Install cementitious underlayment over cured membrane if required to maintain manufacturer's warranty and in thickness required to maintain the warranty.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform installation inspections.

B. Installation Inspections: Inspect substrate preparation and installation of system components to ensure compliance with manufacturer's written instructions and to ensure that a complete MVE-control system is installed without deficiencies.

1. Verify that surface preparation meets requirements.
2. Verify that component coats and complete MVE-control-system film thicknesses comply with manufacturer's written instructions.
3. Verify that MVE-control-system components and installation areas that evidence deficiencies are repaired according to manufacturer's written instructions.

C. MVE-control system will be considered defective if it does not pass inspections.

3.5 PROTECTION

A. Protect MVE-control system from damage, wear, dirt, dust, and other contaminants before floor covering installation. Use protective methods and materials, including temporary coverings, recommended in writing by MVE-control system manufacturer.

B. Do not allow subsequent preinstallation examination and testing for floor covering installation to damage, puncture, or otherwise compromise the MVE-control system membrane.

END OF SECTION 090561.13

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SECTION 092100 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Gypsum drywall partitions, ceilings, soffits, fascias and accessories.
2. Gypsum board shaft wall assemblies.
3. Interior gypsum board.
4. Mold and mildew resistant gypsum board.
5. Tile backing panels.
6. Nonload-bearing steel framing members for gypsum board assemblies.

C. Related Requirements:

1. Division 05 Section "Cold-Formed Metal Framing" for interior non-load-bearing wall studs..

1.2 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.3 ACTION SUBMITTALS

A. Product Data: Submit product data for each type of product specified.

B. Sustainable Design Submittals:

1. Product Data: For adhesives and sealants, indicating VOC content.
2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For ceiling materials, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Submit detailed shop drawings including plans, elevations, sections, details of components, and attachments to other units of Work for unusual conditions in connection with gypsum board assemblies.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For firestop tracks and shaft wall assemblies, from ICC-ES.

B. Sustainable Design Submittals:

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1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Sourcing: For recycled content of product, separately identifying the % of pre-consumer (post-industrial) recycled content and % of post-consumer recycled content.
3. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
4. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

C. Certificates: Certification signed by manufacturer of gypsum board assembly components certifying that their products comply with specified requirements, comply with UL designations shown and are approved for use by local authorities having jurisdiction.

D. Calculations: Provide engineering calculations for all engineered partition assemblies based on performance criteria, signed and sealed by an Engineer licensed to practice in State of Jurisdiction.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: For each product, obtain from a single manufacturer for the entire scope of the project.

B. Installer Qualifications: The gypsum board work shall be performed by a firm having five (5) year experience in the application of gypsum board and shaft wall systems on projects similar in size and scope to this Project.

1.6 ENVIRONMENTAL CONDITIONS

A. General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fabrication and System Engineering Requirements:

1. Drawings of metal support system assemblies are diagrammatic and show design intent of finished profiles, shapes and forms; relationships between elements; location, identification, dimension and size of components, assemblies and accessories; and details and diagrams of connections.
2. Based on stud spacing indicated on drawings, engineer, fabricate, assemble and install metal support systems to meet or exceed the criteria indicated and specified, to conform to the profiles indicated and to other requirements of the Contract Documents, to comply with requirements of the latest "SSMA Product Technical Guide" and ASTM C754 as well as applicable governing codes and regulations, and to provide structurally sound assemblies.

    a. Walls shown in section may exceed floor to floor specified in the SSMA Product Technical Guide", and walls may support large, heavy monitors, sign bands, wall panels. Studs for these applications shall be gaged via fabrication engineering

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and design by the Contractor's licensed Professional Engineer to support imposed loads and comply with deflection limits specified in structural performance below.

b. For shaft wall assemblies provide assemblies based on manufacturers systems and AER-09038 Report published by Progressive Engineering Inc., latest edition, or equal from other named manufacturers.

c. Where drywall is required to support imposed loads of wall and ceiling mounted items, coordinate with trades providing that work, to obtain imposed loads for engineering of gypsum wall board assemblies. These requirements include but are not limited to

1) Miscellaneous metal supports specified in Division 05, Section "Metal Fabrications",
2) Handrails and railing supports specified in Division 05 Sections "Pipe and Tube Railings", "Metal Stairs", "Decorative Metal Railings and Screens",
3) Decorative Metal and Woodwork items specified in "Decorative Metals", "Decorative Formed Metal", Division 06 Section "Architectural Woodwork".
4) Other Sections that rely on gypsum board assemblies for primary support.

B. Structural Performance: Provide steel framing capable of supporting specified gypsum board panels and withstanding loads within limits and under conditions indicated.

1. Unless otherwise indicated, engineer and install partitions to withstand a minimum inward and outward horizontal pressure of 5 psf normal to the plane of the wall, with a maximum deflection of l/240 of span in height, not to exceed 1/2 inch.

a. With Standard Gypsum Board and Tile Backing Panels Scheduled to Receive Ceramic Tile Finishes: Horizontal deflection of L/360 of the wall height under dead load and a minimum positive and negative pressure of 5 lbf/sq. ft. (239 Pa).

b. At partitions indicated to support large format tiles (defined in the TCNA as stone, porcelain, glass, and other tiling with at least one dimension greater than 15 inches(381mm) provide minimum 33 mils (20 gage structural) steel studs max. 16 inches(406mm) on center, with studs vertically braced 4 ft.(1219 mm). o.c. for full height of partition except if limiting height requires heavier mil thickness as follows;

1) Engineer, fabricate and install partition with mil thickness of structural quality and depth required to comply with floor to floor limiting heights and a maximum deflection of L/360 or 1/2 inch at mid span, whichever is more severe.

2. Shaft Wall Systems: Deflection of shaft wall systems shall be limited to L/240 of the span in height.

a. Finishes: Where room side finish is veneer plaster, lath and plaster or ceramic tile, deflection of shaft wall systems shall be limited to L/360 of the span in height.

b. Shaft Wall Horizontal Duct Enclosures: Engineer, fabricate, and install horizontal duct enclosures to safely span between supports indicated within the following deflection limits:

1) Horizontal deflection of L/240 of the enclosure between supports.

c. Elevator Hoistways: Air pressure within hoistway: Intermittent loads of 10 psf with maximum mid-span deflection of L/240

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C. Unless otherwise indicated, engineer and install gypsum drywall ceilings to withstand a minimum vertical pressure of 10 psf and a deflection not to exceed l/360 of the distance between supports.

D. Engineer, fabricate, and install gypsum board assemblies enclosing functions including, but not limited to, stair towers, shafts, plenum and air shafts, and interior atria with slab on one side, so that the completed assembly will withstand a minimum positive and negative pressure of 10 lbf/sq. ft.(478 Pa) normal to the plane of the wall.

1. Partitions surrounding stair enclosures shall meet the required pressure of 10 psf(478 Pa), spaced at 16 inches on center with a minimum of 18 gage steel studs to meet the limiting height of the wall at a horizontal deflection of L/240.
2. Atrium partitions with slabs on both sides shall meet the required pressure of 7.5 psf with a horizontal deflection of L/240.
3. Loading Criteria for Partitions Surrounding Elevator Hoistways: Completed system shall withstand the minimum inward and outward air pressure recommended by the elevator manufacturer, but in no case less than 10 psf (478 Pa) while maintaining an airtight and smoke-tight seal.

E. At demountable partitions and all-glass partitions and entrances, install lateral supports above suspended ceilings using metal studs system as required to comply with performance criteria for drywall partitions. Install braces perpendicular to walls every 48 inches on center along the entire length of the partition.

F. Finished installation shall be smooth and flat not to exceed 1/8 inch in 10 ft.(3mm in 3048mm), noncumulative along entire run of partition. If not in compliance with this requirement, tile installer must correct before proceeding with installation

G. Where non-structural metal studs specified in this section cannot comply with performance requirements specified or are not on the SSMA charts for floor to floor limiting heights, use non-load bearing cold formed metal framing specified in Division 05 Section "Cold Formed Metal Framing" to support partitions, suspended ceilings and imposed loads of finishes and equipment.

H. Perform testing to verify that power actuated fasteners can develop pullout capacity and other requirements of ASTM C754. Contractor shall be responsible for damage to ceiling substrates.

I. Fire Test Response Characteristics: For fire resistance rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

J. Prescribed UL Design Numbers which may be called for on this Project and may be required as determined during the construction process if existing conditions dictate. The list of assemblies below is not intended to represent all rated conditions designated in whole of the Contract Documents or those that may be considered viable alternates (where approved by Architect). UL listed fire rated assemblies include, but are not limited to the following:

1. Wall Systems: Refer to Drawings.
2. Division 07 Section "Through-Penetrations Firestop Systems" for firestopping.
3. Division 07 Section "Fire-Resistive Joint Systems" for fire resistive joints.

K. STC-rated assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

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L. Low-Emitting Materials:

1. For ceiling assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the CDPH Standard Method v1.2.
2. Adhesives and Sealants wet-applied on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2. All adhesives and sealants wet-applied onsite must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4/v4.1 BD+C: New Construction".

2.2 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

B. Steel Framing: Comply with ASTM C645 requirements and ASTM A653, G60 for framing in wet areas and G40 for dry areas, hot-dip galvanized zinc coating. Where stud thickness is indicated, it is a minimum. Equivalent thicknesses will not be accepted.

1. Runners: ASTM C645, roll formed galvanized steel, channel or angle shape, type, size and gauge as recommended by the drywall manufacturer for the wall system indicated.
2. Metal Studs: ASTM C645, type "ST" and "CWS" roll-formed galvanized steel, width and gauge as noted, but not less than 33 mils structural quality and as recommended by the drywall manufacturer for the wall system and height indicated.
3. Metal Furring Channels: Galvanized steel, flanged channel type, 7/8 in. deep; for wall furring and ceiling attachment.
4. Double Runner System: ASTM C645 top runners, inside runner with 2 inch deep flanges and fastened to studs, and outer runner sized to friction fit inside runner.
5. 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.

    a. At partitions indicated to support gravity and pullout loads of imposed fixtures, equipment, services, heavy trim, furnishings and similar work, engineer and provide additional framing, blocking and bracing support within partitions, or increase mil thickness or reduce spacing as required to support imposed loads and deflection criteria. Where floor to floor limiting heights are exceeded, provide additional bracing at midpoint of wall.

        1) Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

    b. Coordinate with Division 06 Section "Miscellaneous Rough Carpentry" for fire retardant treated solid wood or plywood blocking.

6. Head-of-Wall Fire Resistive Joint Systems: Comply with UL's "Fire Resistance Directory" under product Category XHBN for top of fire rated partitions extending to structure.

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7. Flat Strap and Backing Plate (Sheet metal grounds for fixture attachment): Steel sheet for blocking and bracing in length and width indicated, provide minimum 54 mils unless otherwise indicated on Drawings, whichever is more stringent.
8. Cold-Rolled Channel Bridging (For fixture attachment or lateral bracing: 53 mils minimum sheet steel thickness, with minimum 1/2 inch wide flanges, 1-1/2 inch deep unless otherwise indicated.

    a. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 68 mils thick, galvanized steel.

9. Hat-Shaped, Rigid Furring Channels: ASTM C645; minimum base metal thickness of 33 mils unless otherwise noted and depth as shown on drawings.
10. Resilient Furring Channels (for acoustic assemblies): 1/2 inch deep, steel sheet members designed to reduce sound transmission, with asymmetrical configuration.
11. Cold Rolled Furring Channels: 54 mils bare steel thickness, with minimum 1/2 inch wide flanges, depth as indicated on drawings.

    a. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 33 mils.
    b. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.062 inch diameter wire, or double strand of 0.048 inch diameter wire.

12. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch minimum uncoated metal thickness of 30 mils, and depth required to fit insulation thickness indicated.
13. Runner Tracks for Shaft wall: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.

    a. Minimum Base-Metal Thickness: 33 mils.

14. Shear Wall and Knee Wall Connector: Clip system designed to resist horizontal torsional and vertical uplift loads as follows:

    a. Basis-of-Design Product: ClarkDietrick "Moment Clips (MC Series)" Minimum 0.118 inch thick, grade 50 Type H (ST50H) 50 ksi L-shaped clips with prepunched holes for steel framing connections and bolt holes for securement to structural slabs through running channels; with ASTM A36 steel stiffening plate 1/4-inch thick, by width required for support of selected studs.

        1) Provide 1/2 inch x 2 inch long Hilti Kwick Bolt 3 anchor bolts or equivalent anchorage calculated to resist tension load for specific application.

15. Elevator Hoistway Entrances: Manufacturer's standard J-profile jamb strut with long-leg length of 3 inches, matching studs in depth, and not less than 33 mils structural quality thick.

C. Grid Suspension System for Interior Ceilings: Comply with ASTM C645, Direct-Hung Heavy Duty System composed of main beams and cross-furring members that interlock.

1. Ceiling Support Members, General: Comply with ASTM C754. Comply with seismic design requirements.
2. Attachment Devices: Size for five times the design load indicated in ASTM C635, Table 1, "Direct-Hung", unless otherwise indicated.

    a. For Concrete, and Concrete Beam Encasements: Power actuated fastener system of type suitable for application indicated, fabricated from corrosion-resistant

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materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling construction, as determined by testing per ASTM E1190, conducted by a qualified testing and inspecting agency.

b. Hanger Attachments to Concrete:

c. Anchors: Capable of sustaining a load equal to 5 times that imposed as determined by ASTM E488, post-installed, chemical anchor or expansion anchor.

3. Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint. Provide one of the following:

   a. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
   b. Rod Hangers: ASTM A510, mild carbon steel threaded rods, 3/8 inch in diameter.
   c. Wire Hangers: ASTM A641, Class 1 zinc coated soft temper steel wire.

4. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 53 mils and minimum 1/2 inch wide flanges, 1-1/2 inches deep unless otherwise indicated.
5. Furring Channels (Furring Members):

   a. Cold-Rolled Channels: 53 mils uncoated-steel thickness, with minimum 1/2 inch wide flanges, 3/4 inch deep.

6. Steel Studs and Runners: ASTM C645, minimum 33 mils thick sheet steel, x 2-12 inch deep, unless otherwise indicated.
7. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep, minimum 33 mils thick sheet steel, unless otherwise indicate.
8. Resilient Furring Channels: 1/2 inch deep members designed to reduce sound transmission, with asymmetrical configuration.

2.3 GYPSUM BOARD, GENERAL

A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Interior Gypsum Board

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. CertainTeed Corp.
   b. Florida Pacific Gypsum LLC.
   c. National Gypsum Company.
   d. USG Corporation.

2. Gypsum Board Type X: ASTM C1396; thickness: 5/8 inch long edges: tapered.
3. Moisture and Mold-Resistant Gypsum Board: ASTM C1396. With moisture and mold-resistant core and paper surfaces; Core 5/8 inch long edges: tapered, with Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274
4. Gypsum Ceiling Board: ASTM C1396; thickness of 1/2 inch long edges tapered and compliant with CDPH v1.2 Low-Emitting Materials performance criteria.
5. Gypsum Shaftliner Board, Moisture- and Mold-Resistant Type X: ASTM C1396/C1396M or ASTM C1658/C1568M; manufacturer's proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces.

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a. Thickness: 1 inch(25 mm).
b. Long Edges: Double bevel.
c. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3273.
d. Product: Subject to compliance with requirements, provide one of the following:

1) CertainTeed "M2Tech Shaftliner Type X."
2) Continental Building Products, "Mold Defense Shaftliner Type X."
3) National Gypsum Company "Gold Bond Fire-Shield Shaftliner XP."
4) USG Corporation "Type X Sheetrock Glass-Mat Panel Mold Tough."

C. Abuse-Resistant Gypsum Board: High density, fire resistant, type X core, with heavy paper face that is highly resistant to scuffing, tested in accordance with ASTM C1629/C1629M.

1. Product: Subject to compliance with requirements, provide the following or comparable product by one of the named manufacturers:

a. CertainTeed Corporation, Extreme Abuse Resistant Type X Gypsum Board.
b. Georgia-Pacific Gypsum LLC, ToughRock Fireguard X Mold Guard Max Abuse-Resistant Gypsum Board.
c. National Gypsum Company, Hi-Abuse XP Wallboard.
d. USG Corporation, Sheetrock Brand, Mold Tough AR Firecode X Panels.

2. Core: 5/8 inch(15.9 mm), Type X.
3. Surface Abrasion: Meets or exceeds Level 3 requirements.
4. Surface Indentation: Meets or exceeds Level 1 requirements.
5. Single-Drop Soft-Body Impact: Meets or exceeds Level 2 requirements.
6. Long Edges: Tapered.
7. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
8. Locations:

a. Dry interior gypsum board partitions in high traffic areas
b. Where indicated on the Drawings.

D. Impact-Resistant Gypsum Board: High density, fire resistant, type X core, reinforced with a fiberglass mesh to provide impact/penetration resistance in accordance with ASTM C1629/C1629M, Level 2.

1. Product: Subject to compliance with requirements, provide the following or comparable product by one of the named manufacturers:

a. CertainTeed Corporation, Extreme Impact Resistant Type X.
b. Georgia-Pacific Gypsum LLC, ToughRock Fireguard X Mold Guard Max Impact Resistant Gypsum Panel.
c. National Gypsum Company, Hi Impact XP Wallboard.
d. USG Corporation, Sheetrock Brand Glass-Matt Panels, Mold Tough Very High Impact Fire Code Type X.

2. Core: 5/8 inch(15.9 mm), Type X.
3. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 3 requirements.
4. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
5. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 3 requirements.
6. Hard-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 3 requirements according to test in Annex A1.
7. Long Edges: Tapered.
8. Locations:

a. Dry interior gypsum board partitions in cores surrounding stair wells and elevator shafts that are not enclosed with shaftwall or CMU.

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b. Where indicated on Drawings.

E. Tile Backing Panels:

1. Moisture and Mold Resistant Gypsum Board: ASTM C1396. With moisture and mold-resistant core and paper surface, 5/8 inch thick, Type X, with long edges tapered, and a mold resistance of 10 when tested in accordance with ASTM D3273 edges. Provide one of the following.

   a. "ToughRock Moisture Guard" by GP Building Products.
   b. "Gold Bond MR Wallboard" by National Gypsum Co.
   c. "Fiberock Aqua-Tough" by USG Corp.

2. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, 5/8 inch thick, with manufacturer's standard edges, and mold resistance of 10 when tested in accordance with ASTM D3273. Subject to compliance with requirements, provide one of the following:

   a. Custom Building Products; Wonderboard.
   b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
   c. USG Corporation; DUROCK Cement Board.

F. Interior galvanized metal trim: ASTM C1047.

1. Corner Reinforcement: "Dur-A-Bead 103" galvanized. Install in one piece when manufactured in length required.
2. Control Joint: "No. 093", roll-formed zinc. Install in one piece when manufactured in length required.

G. Aluminum Reveal Trim: ASTM B221, extruded aluminum alloy 6063-T5, trim with 1/4 in. dia. holes in fins for attachment to drywall, staggered 1/2 o.c.; longest lengths available; primed for finish painting; Unless otherwise shown or indicated, provide the following:

1. Profiles and dimensions: Comply with requirements indicated on Drawings.
2. Manufacturers: Provide products complying with requirements and made by one of the following:

   a. Fry Reglet Architectural Metals.
   b. Gordon, Inc.
   c. MM Systems Corporation
   d. Pittcon Architectural Metals, LLC.

3. Finishes: As indicated on Drawings for each type of trim and application.

   a. Clear anodized.
   b. Primed for finish painting.

H. Fasteners: Comply with wallboard manufacturer's printed recommendations and as follows:

1. For securing to concrete or masonry use hardened steel concrete stub nails of sufficient length to provide permanent fastening.

I. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

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J. Steel Drill Screws: ASTM C1002, unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacture.

K. Isolation Strip at Exterior Walls: Provide asphalt saturated organic felt or foam gasket.

L. Joint Treatment Materials: Provide materials complying with ASTM C475, ASTM C840, and recommendations of manufacturer of both gypsum board and joint treatment materials for the application indicated.

1. Joint Tape: Pressure sensitive or staple attached, open-weave, glass-fiber reinforcing tape with setting-type joint compound.

a. Joint Tape for Tile Backing Panels:

1) Moisture and Mold-Resistant Gypsum Board: 10-by-10 glass mesh.
2) Cementitious Backer Units: As recommended by panel manufacturer.

2. Setting-Type Joint Compounds: Field mixed-hardening compound.

a. Joint Compound for Tile Backing Panels:

1) Moisture and Mold-Resistant Gypsum Board: As recommended by backing panel manufacturer.
2) Cementitious Backer Units: As recommended by backer unit manufacturer.

M. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum base panels to face panels in multilayer construction.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to SCAQMD Rule 113.
2. Laminating adhesive applied on site shall comply with the testing and product requirements of the CDPH Standard Method v1.2.

N. Elastomeric (Acoustical) Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, elastomeric silicone sealant complying with ASTM C920 that has a 50% minimum compression and expansion ability, and effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90. Product has flame-spread and smoke-developed indexes of less than 25 per ASTM E84.

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

a. Elastomeric (Acoustical Sealant) for Exposed and Concealed Joints:

1) Dow Corning; 790 Silicone Sealant or Contractor's Construction Sealant (CCD).
2) 3M FireDam Spray 200.
3) Tremco Dymonic 100 DS.
4) STI, AS200 Elastomeric Spray Sealant.

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2. Environmental Performance:

    a. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to SCAQMD Rule 113.
    b. Acoustical joint sealant shall comply with the testing and product requirements of the CDPH Standard Method v1.2'

O. Sound Attenuation Fire Blankets (SAFB): ASTM C665, Type I (blankets without membrane facing); "Thermafiber Sound Attenuation Blanket", (USG) 4 in. thick unless otherwise shown. To be provided at all partitions (both rated and non-rated) unless otherwise indicated.

1. Recycled Content of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 65 percent.
2. Formaldehyde Free: Comply with CARB requirements for ultra-low emitting formaldehyde (ULEF) resins or no added formaldehyde resins.

P. Partition End Closures: Continuous closed cell neoprene compressible filler complying with ASTM D1056; with pressure sensitive temporary positioning adhesive on both sides; thickness and width as shown, or as required to provide a complete sound seal at curtain wall mullions and glass curtain walls.

Q. Electrical Box Pads: Polybutene pads, 1/8 inch thick.

1. Products: As indicated on Drawings.

R. Non-Load-Bearing Steel Framing Installation: ASTM C754 and ASTM C840 requirements that apply to framing installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Steel Framing Installation Standard: Install metal framing in accordance with ASTM C754.

1. Space studs max. 16 in. o.c., unless otherwise shown, but not greater than spacings required by referenced installation standards for assembly types shown Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior walls, install studs so flanges within framing system point in same direction.
2. 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.

    a. 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.
    b. At opening frames install special studs, as recommended by wallboard manufacturer.
    c. Do not screw studs to runners as required to allow for deflection of floor slabs.
    d. Use minimum number of fasteners as recommended by gypsum drywall manufacturer, for installation of floor runner to floor.

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3. At openings and cutouts and where wall-mounted items are indicated, install additional framing, reinforcing and blocking to support built-in anchorage and attachment devices for other work, and install securely as required to support all imposed loads.

    a. Where cabinetry and other items are indicated to be wall mounted, provide fire retardant treated wood blocking within drywall studs and bracing between studs at mid-height of item to be supported. Indicate location of blocking and bracing on surface of drywall partition. Wood blocking is specified in Division 06 Section "Miscellaneous Rough Carpentry".
    b. Identify location of wood blocking and reinforcing on the face of partitions so that other trades know where blocking and reinforcement has been provided.

B. 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.

1. Firestop Track: Where indicated, install to maintain continuity of fire resistance rated assembly indicated.

C. Suspension System: Provide metal ceiling suspension systems of types, structural classifications, and finishes indicated that comply with the requirements of Building Code, of suitable design and adequate strength to support the items occurring in or on the gypsum board ceiling.

1. Provide hangers spaced at 2 ft. x 3 ft. or less on centers. Each hanger shall be capable of carrying suspended ceilings and items imposed on ceilings plus an additional 200 lbs located at midspan with a deflection not to exceed 1/360 of span.
2. Provide a pull test for a minimum of 30 percent of hangers to verify handling capacity of hangers.
3. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
4. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
5. Suspend hangers from building structure as follows:

    a. 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.
    b. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
    c. Provide sufficient hangers for runner channels on each side of light fixtures, ceiling diffusers and grilles, access panels and other items penetrating the ceiling.
    d. Where ceilings are suspended below ductwork, piping or other building elements which are not suitable for ceiling attachment due to strength limitations, or restrictions of local authorities having jurisdiction, provide additional supplemental framing, supports and related work in the form of trapezes or equivalent devices as required to span beneath these elements from suitable support locations. Keep hangers and braces 2 in. clear of ducts, pipes and conduits.

6. Secure furring channels to primary carrying channels by clips or wire ties. Space furring channels on centers recommended by wallboard manufacturer. Fasten wallboard with screws to furring channels on 12 in. o.c.

D. Suspension System 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.

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E. Gypsum Board Application and Finishing Standards: Install gypsum board in accordance with ASTM C840 and GA-216.

1. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
2. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
3. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
4. Form control and expansion joints with space between edges of adjoining gypsum panels.
5. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc., except in chases braced internally.

    a. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
    b. Fit gypsum panels around ducts, pipes, and conduits.
    c. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4 to 3/8 inch wide joints to install sealant.

6. Where chase walls are indicated, provide bracing between parallel rows of studs. Unless otherwise indicated, provide gypsum board braces no less than 1/2 inch-(12.7 mm) thick by 12 inches(300 mm) wide and cut to width of chase. Locate at quarter points in wall height between each pair of parallel studs. Fasten with not less than 3 screws at each stud.
7. Do not bridge architectural or building expansion joints with gypsum wall assemblies; frame both sides of expansion joints with furring and other support.
8. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4 to 1/2 inch wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
9. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
10. Control Joints: Install control joints according to ASTM C840 and in specific locations as shown on drawings or at spacings indicated in the specification and at locations approved by Architect, while maintaining fire-resistance rating of gypsum board assemblies.
11. Attachment to Steel Framing: Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
12. Attach gypsum panels to framing provided at openings and cutouts.
13. Install the first run of gypsum board consistently at a minimum of 1/4 inch to maximum 3/4 inch above finish floor.

F. Acoustical Requirements: Seal construction at perimeters, behind control joints, expansion 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. Apply continuous beads of acoustical sealant at both faces of runners or plates with floor and ceiling construction, and wherever wallboard abuts dissimilar materials (i.e., doors and windows)

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Apply prior to installation of wallboard. Comply with ASTM C919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

1. Fill open spaces between wallboard and fixtures, cabinets, ducts and other flush or penetrating items, with continuous bead of acoustical sealant.
2. Provide acoustical sealant at sides and backs of electrical boxes to completely seal openings and joints.
3. Install acoustical electrical box pads over all electrical and other type of device boxes in sound rated walls, including but necessarily limited to electrical junction boxes, electrical switch boxes, power outlet receptacle boxes, thermostat control boxes, telephone outlet boxes and television cable or antenna outlet boxes.

G. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

H. Partition End Fillers: Install compressible filler continuously between window wall mullion and gypsum board partition end filler panels, maintaining a min. of 3/4 in. spacing to allow for curtain wall deflection. Utilize self-adhesive to position end fillers on curtain wall mullion. Adhesively apply compressible filler continuously from floor to ceiling including underside of soffit. Do not penetrate curtain wall mullion with any type of fastenings. Prior to installing partition studs or vertical support members, apply adhesive to side facing partition to allow for two-sided adhesion and a continuous seal.

1. Provide acoustic barrier within convectors at demising partitions, consisting of 2 layers of gypsum board with 1-5/8 inch metal stud framing and SAFB insulation secured with angle framing and sealed with acoustic insulation.

I. Install interior gypsum board in the following locations:

1. Type X Moisture and Mold Resistant Type: For use throughout unless other type is required as indicated on drawings and specified herein.
2. Flexible Type: Apply in double layer at curved assemblies.
3. Ceiling Type: Ceiling and soffit surfaces.
4. Glass Mat Water Resistant Type: At food prep areas, wet utility areas, custodial rooms, single use toilet rooms to deck, at walls behind and around sinks (wall mounted and countertop types) to deck, and at walls within a 5 ft.-0 in. diameter radius from exterior doors.
5. Cementitious Backerboard: At tiled walls of shower and bath enclosures, at large format and ultra large format tile facing.
6. Gypsum Shaftliner Board at fire-rated shaft wall assemblies where indicated. Use impact resistant drywall with shaft wall system specified in article above.
7. Impact-Resistant Type: For use in core walls, service corridors and main corridors where equipment and carts will be moved unless other type is required as indicated on drawings and specified herein.

J. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.

1. Space screws a maximum of 12 inches o.c. for vertical applications.
2. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

K. Single Layer Application

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1. Ceilings: On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
2. Walls: Apply wallboard on walls horizontally for ceiling heights less than 8 ft. 1 in. Where ceiling heights are over 8 ft. 1 in. or wall is 4 ft. wide or less apply wallboard vertically. Where horizontal application is used on walls, apply top panel first and butt tight to ceiling. Where vertical application is used apply wallboard from ceiling to floor by single length of wallboard. Hold joints back at least 8 in. from corners of door frames. Space nails not more than 8 in. o.c., and space screws not more than 16 in. o.c.
3. At existing partitions, where shown, add an additional layer of gypsum drywall laminated to the existing drywall partitions, and secured with fasteners same as for single layer application. Continue drywall 3 to 6 in. above suspended ceiling (verify in field). In addition, provide additional acoustical insulation within drywall cavities as required to provide acoustical rating required.

L. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base layer joints, unless otherwise indicated or required by fire resistance rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face layer joints offset at least one stud or furring member with base layer joints, unless otherwise indicated or required by fire resistance rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

M. Applying Tile Backing Panels

1. Moisture and Mold Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at toilets and where indicated locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.
2. Cementitious Backer Units: ANSI A108.11, at showers, tubs, janitor closets and where indicated.
3. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.
4. Support ends of boards over framing. Fasten boards to studs with 1-1/4 inch long screws spaced 16 inches o.c. and at perimeter 8 inches o.c. not less than 3/8 inch nor more than 5/8 inch for board edges.
5. Install Moisture and Mold Resistant gypsum wallboard of the same thickness above tile backer board on walls with ceramic tile wainscot and full height on other walls in toilet rooms and wet areas.
6. Seal joints, cuts, and penetrations with silicone sealant.

N. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

O. Form curved wallboard surfaces to provide a finish surface which is a smooth, even curve without flat faces or other imperfections. Comply with Gypsum Association GA-226 “Application of Gypsum Board to Form Curved Surfaces”.

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P. Shaft Wall: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:

1. ASTM C754 for installing steel framing except comply with framing spacing indicated.
2. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.

    a. At elevator hoistway entrance door frames, provide jamb struts on each side of door frame.
    b. Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip accurately positioned and secured behind at least one layer of face panel.

2. Integrate stair hanger rods with gypsum board and gypsum board shaft-wall assemblies by locating cavity of assemblies where required to enclose rods.
3. At penetrations in gypsum board shaft-wall, and gypsum wall board maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.
4. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.
5. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
6. Control Joints: Install control joints at locations indicated on Drawings according to ASTM C840 and in accordance with the maximum spacing indicated in the specifications, while maintaining fire-resistance rating of gypsum board shaft-wall assemblies.
7. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with ASTM C919 requirements or with manufacturer's written instructions, whichever are more stringent.
8. In elevator shafts where gypsum board shaft-wall assemblies cannot be positioned within 2 inches(50 mm) of the shaft face of structural beams, floor edges, and similar projections into shaft, install 5/8-inch(16 mm)- thick, gypsum board cants covering tops of projections. No recesses allowed (at steel beams especially).

    a. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in gypsum board adhesive and secure top edges to shaft walls at 24 inches(610 mm) o.c. with screws fastened to shaft-wall framing.
    b. Where cants exceed 2 inches(51 mm), support gypsum board cants, with steel stud framing installed 24 inches(610 mm) o.c. and extend studs from the projection to shaft-wall framing.

Q. Installing Trim Accessories: Install trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

1. Control Joints: Install control joints at locations indicated on Drawings, or if not indicated, according to ASTM C840 and in specific locations approved by Architect for visual effect.
2. Interior Trim: Install in the following locations:

    a. Cornerbead: Use at outside corners unless otherwise indicated.

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b. Bullnose Bead: Use where indicated.
c. LC-Bead: Use at exposed panel edges.
d. L-Bead: Use where indicated.
e. U-Bead: Use where indicated.
f. Curved-Edge Cornerbead: Use at curved openings.

3. Aluminum Trim: Install in locations indicated on Drawings.

R. Finishing Gypsum Board, 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.

1. Prefill open joints, rounded or beveled edges, and damaged surface areas.
2. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

S. Gypsum Board Finish Levels: Finish joints of fire resistance rated assemblies in accordance with requirements of their listing for testing of assemblies. Finish panels to levels indicated below and according to ASTM C840 and GA-216 for locations indicated:

1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire resistive rated assemblies and sound rated assemblies.
2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where backing panels form substrates for tile, and where indicated. Provide level 2 finishes in unexposed areas such as insides of closets, electrical rooms, where backing panels form substrates for tile, and where indicated.
3. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated. For gypsum board surfaces exposed to view, unless otherwise indicated.
4. Level 5: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply a min. 1/16 in. skim coat of joint compound over entire surface where indicated for a Level “5" finish in accordance with “Recommended Specification Levels of Gypsum Board Finish” as developed by AWCI, CISCA, Gypsum Association and PDCA. Provide level 5 finish at gypsum board surfaces where indicated to receive the following:

a. Smooth finishes.
b. Curved partitions.
c. Partitions with continuous, unbroken length of 20 feet.
d. Horizontal and vertical surfaces of soffits.
e. Partitions with wall washing light fixtures.
f. Corridor accent walls with vertical lighting.

T. Tile Backing Panels: Finish moisture and mold resistant gypsum board and cementitious backer units according to manufacturer's written instructions.

U. Protect adjacent surfaces from drywall compound and texture finishes and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

1. Remove and replace panels that are wet, moisture damaged, and mold damaged.

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V. Tolerances: Finish surfaces within 1/4 in. in 8 ft. for plumb, level, warp and bow. Finish surfaces within 1/16 in. between planes of board faces.

END OF SECTION 092100

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SECTION 092713 - GLASS-FIBER-REINFORCED GYPSUM FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Glass-fiber-reinforced gypsum fabrications.

    a. Column covers.

C. Related Requirements:

1. Division 09 Section “Non-Structural Metal Framing.”

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, weights, dimensions of individual components and profiles, and finishes.

B. Sustainable Design Submittals:

1. Product Data: For adhesives and sealants, indicating VOC content.
2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For ceiling materials, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and assembly of glass-fiber-reinforced gypsum fabrications.
3. Indicate requirements for joint treatment.
4. Indicate location of control joints.

D. Samples: For each exposed product and for each color and texture specified.

1. Linear Moldings: 24-inch- (600-mm-) long section with finished joint. Show complete pattern.
2. Nonlinear Shapes: 24-inch- (600-mm-) long section with finished joint.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with one another, using input from installers of the items involved:

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1. Perimeter moldings.

B. Sustainable Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Data: For recycled content of product, separately identifying the percentage of pre-consumer (post-industrial) recycled content and percentage of post-consumer recycled content.
3. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
4. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

1.4 MOCKUPS

A. Build mockups to set quality standards for fabrication, installation and acceptable aesthetic effect.

1. Build mockup of each type of glass-fiber-reinforced gypsum fabrication. Include every type of field-finished joint.
2. Paint mockups to match finish indicated and to comply with requirements specified in Division 09 Section "Painting."
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C1467/C1467M.

1.6 FIELD CONDITIONS

A. Environmental Conditions:

1. Comply with ASTM C1467/C1467M.
2. Do not deliver or install glass-fiber-reinforced gypsum fabrications until building is enclosed, wet-work is complete, and HVAC system is operating and continuously maintaining temperature and relative humidity at levels intended for building occupants.

B. Conditioning: Acclimatize glass-fiber-reinforced gypsum fabrications to ambient temperature and humidity of spaces in which they will be installed. Remove packaging and move units into installation spaces not less than 48 hours before installing them.

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PART 2 - **PRODUCTS**

2.1 MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following:

1. Armstrong World Industries.
2. Formglas Products LTD.
3. GC Products, LLC.

2.2 GLASS-FIBER-REINFORCED GYPSUM FABRICATIONS

A. Fabrications: Molded, glass-fiber-reinforced gypsum units complying with ASTM C1381/C1381M.

1. Basis of Design: Armstrong World Industries “PLASTERFORM Column Covers.”

B. Embedments: As standard with glass-fiber-reinforced gypsum fabrication manufacturer and as required for reinforcement and for anchorage to substrates and framing.

C. Finish: Smooth for gloss paint finish.

D. Low-Emitting Materials:

1. For ceiling assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the CDPH Standard Method v1.2.
2. Adhesives and Sealants wet-applied on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
3. All adhesives and sealants wet-applied onsite must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4/v4.1 BD+C: New Construction”.

2.3 AUXILIARY MATERIALS

A. Adhesives: As recommended in glass-fiber-reinforced gypsum fabrication manufacturer's written instructions.

B. Steel Drill Screws: ASTM C1002, unless otherwise indicated.

1. Screws complying with ASTM C954 for fastening glass-fiber-reinforced gypsum fabrications to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

C. Joint-Treatment Materials: ASTM C475/C475M.

2.4 FABRICATION

A. Fabricate glass-fiber-reinforced gypsum units in factory to comply with ASTM C1381/C1381M, with smooth-finished surfaces; repair hollows, voids, scratches, and other surface imperfections. Fabricate units in lengths and sizes that will minimize number of joints between abutting units.

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B. Embedments: Incorporate embedments into units to develop the full strength of glass-fiber-reinforced gypsum fabrications. Cover embedments with not less than 3/16-inch (5-mm) thickness of glass-fiber-reinforced gypsum composite.

C. Connection Hardware: Designed and fabricated to support and connect glass-fiber-reinforced gypsum fabrications to hangers, support framing, and substrates.

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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with ASTM C1467/C1467M.

B. Install glass-fiber-reinforced gypsum fabrications level, plumb, true, and aligned with adjacent materials. Use concealed shims where required for alignment.

C. Attach glass-fiber-reinforced gypsum fabrications to framing and substrates with steel drill screws unless otherwise indicated. Do not use pneumatic staple guns. Countersink screw heads below adjoining finished surface.

1. Predrill fastener holes in units. Clean fastener holes to remove dirt and oil.
2. Locate fasteners not less than 5/16 inch (7.9 mm) from edges or ends of units.

D. Suspended Systems: Attach suspended glass-fiber-reinforced gypsum fabrications to structure with tie wire at each attachment point indicated on approved Shop Drawings. Comply with requirements for hangers specified in Section 092216 "Non-Structural Metal Framing."

E. Where glass-fiber-reinforced gypsum fabrications are joined to form composite units, join fabrications with adhesive. Band or brace units together until adhesive cures.

F. Install control joints between glass-fiber-reinforced gypsum fabrications where indicated.

G. Use joint-treatment materials to finish glass-fiber-reinforced gypsum fabrications to produce surfaces ready to receive primers and paint finishes specified in Section 099123 "Interior Painting."

1. Finish glass-fiber-reinforced gypsum fabrications according to ASTM C840 requirements for Level 5 and to match surface texture of units.
2. Repair hollows, voids, scratches, and other surface imperfections on units.

END OF SECTION 092713

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SECTION 096536 - STATIC-CONTROL RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Static-dissipative, vinyl composition floor tile.

C. Related Requirements:

1. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with static-control resilient flooring.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to static-control resilient flooring including, but not limited to, the following:

a. Examination and preparation of substrates to receive static-control resilient flooring.
b. Installation including seamless installation techniques.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

C. Sustainable Design Submittals:

1. Product Data: For adhesives, sealants, coatings and grouts indicating VOC content.
2. Laboratory Test Reports: For adhesives, sealants, coatings and grouts indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For flooring products onsite indicating compliance with requirements for low-emitting materials.

D. Shop Drawings: For each type of static-control resilient flooring. Include floor-covering layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.
2. Show locations of inscribed maintenance tiles.
3. Submit grounding diagram showing location of grounding strips and connections.

E. Samples for Initial Selection: For each type of static-control resilient flooring.

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F. Samples for Verification: For each type of static-control resilient flooring, of size indicated below:

1. Floor Tile: Full-size units.

G. Product Schedule: For static-control resilient flooring. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sustainable Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Data: For recycled content of product, separately identifying the percentage of pre-consumer (post-industrial) recycled content and percentage of post-consumer recycled content.
3. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
4. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for static-control resilient flooring.

D. Manufacturer's Certification: Submit manufacturer's statement certifying that products selected are appropriate for conditions of use and comply with requirements specified.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of static-control resilient flooring to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS (ATTIC STOCK)

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for static-control resilient flooring.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

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1. Build mockups for static-control resilient flooring including resilient base and accessories.

    a. Size: Minimum 100 sq. ft. (9.3 sq. m) for each type, color, and pattern in locations directed by Architect.

1.8 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 storing.

B. Store static-control resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer but not less than 50 degrees F (10 degrees C) or more than 90 degrees F (32 degrees C).

1. Floor Tile: Store on flat surfaces.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 degrees F (21 degrees C) or more than 95 degrees F (35 degrees C), in spaces to receive static-control resilient flooring during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 degrees F (13 degrees C) or more than 95 degrees F (35 degrees C).

C. Close spaces to traffic during static-control resilient flooring installation.

D. Close spaces to traffic for 48 hours after static-control resilient flooring installation.

E. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Static-Dissipative Properties: Provide static-control resilient flooring with static-control properties indicated as determined by testing identical products per test method indicated by an independent testing and inspecting agency.

1. Electrical Resistance: Test per ESD-STM-7.1.

    a. Average greater than 1 megohm and less than or equal to 1000 megohms when installed floor coverings are tested surface to ground.

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2. Static Generation: Less than 300 V when tested per AATCC-134 at 20 percent relative humidity with conductive footwear.
3. Static Decay: 5000 to zero V in less than 0.25 seconds when tested per FED-STD-101C/4046.1.

A. Low-Emitting Materials:

1. Flooring products on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. All adhesives, sealants, coatings and grouts on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
3. All adhesives, sealants, coatings and grouts on site must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4 BD+C."

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

C. Dynamic Coefficient of Friction (DCOF): For flooring installed on walkway surfaces, provide products with the following values determined by testing identical products in accordance with ANSI A326.3 using the BOT-3000 to measure slip resistance of flooring, with the following minimum classification, reference category and performance:

1. Level Surfaces and Treads:

a. Interior, Dry (ID): ≥0.42 dry DCOF.
b. Interior, Wet (IW): > 0.42 wet DCOF
c. Interior, Wet Plus (IW+): minimum DCOF of 0.50.
d. Exterior Wet Classification (EW): Minimum DCOF of 0.55.
e. Oils/Greases (O/G): Minimum DCOF of 0.55.

2. Ramp Surfaces: 0.55 minimum DCOF.

2.2 STATIC-DISSIPATIVE RESILIENT FLOOR COVERINGS

A. Static-Dissipative, Vinyl Composition Floor Tile: ASTM F1066 (vinyl composition floor tile, nonasbestos formulated), Class 2 (through-pattern tile).

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armstrong World Industries, Inc.

2. Thickness: Not less than 0.125 inch (3.2 mm).
3. Size: 12 by 12 inches (305 by 305 mm).
4. Colors and Patterns: As indicated on Drawings.

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2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.

1. Verify adhesives have a VOC content of 50 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Grounding Strips: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor-covering system to ground connection.

D. Maintenance Floor Tiles: Special floor tiles inscribed "Conductive floor. Do not wax."

E. Floor Polish: Provide protective, static-control liquid floor polish products as recommended by floor-covering manufacturer.

1. Verify compliance with VOC general emissions testing criteria of CDPH Standard Method v1.2.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer and manufacturer's representative present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion or static-control characteristics of floor coverings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of static control resilient flooring indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions and with oversight by manufacturer's representative to ensure adhesion of static-control resilient flooring and electrical continuity of floor-covering systems.

B. Concrete Substrates: Prepare according to ASTM F710.

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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 and as follows. Proceed with installation only after substrates pass testing.

    a. Perform anhydrous calcium chloride test according to ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    b. Perform relative-humidity test using in situ probes according to ASTM F2170. Proceed with installation only after substrates have maximum 75 percent relative-humidity level measurement.

C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

D. 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.

E. Do not install static-control resilient flooring until it is same temperature as space where it is to be installed.

1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

F. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

3.3 INSTALLATION, GENERAL

A. Install static-control resilient flooring according to manufacturer's written instructions and with oversight by manufacturer's representative.

B. Embed grounding strips in static-control adhesive. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.

C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings. Extend static-control resilient flooring to center of door openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

F. Install static-control resilient flooring on covers for telephone and electrical ducts, and similar items in installation areas. Maintain overall continuity of color and pattern with pieces of static-control resilient flooring installed on covers. Tightly adhere static-control resilient flooring edges to substrates that abut covers and to cover perimeters.

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G. Adhere static-control resilient flooring to substrates using a full spread of static-control 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 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 floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.

1. Lay floor tiles square with room axis.

C. Match floor tiles for color and pattern by selecting floor tiles from cartons in same sequence as manufactured and packaged if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.

1. Lay static-dissipative, vinyl composition floor tiles in pattern of colors and sizes indicated.

D. In each space where conductive, solid vinyl floor tile is installed, install maintenance floor tile identifying conductive floor tile in locations approved by Architect.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified testing agency to test electrical resistance of static-control resilient flooring for compliance with requirements.

1. Arrange for testing after static-control adhesives have fully cured and static-control resilient flooring has stabilized to ambient conditions and after ground connections are completed.
2. Arrange for testing of static-control resilient flooring after performing floor polish procedures.

B. Static-control resilient flooring will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of static-control resilient flooring.

B. Perform the following operations immediately after completing static-control resilient flooring:

1. Remove static-control adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect static-control resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

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1. Do not wax static-control resilient flooring.
2. If recommended in writing by manufacturer, apply protective static-control floor polish formulated to maintain or enhance floor covering's electrical properties; ensure static-control resilient flooring surfaces are free from soil, static-control adhesive, and surface blemishes.

    a. Verify that both floor polish and its application method are approved by manufacturer and that floor polish will not leave an insulating film that reduces static-control resilient flooring's effectiveness for static control.

D. Cover static-control resilient flooring until Substantial Completion.

END OF SECTION 096536

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SECTION 096723 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the Work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Resinous flooring.
2. Integral cove base accessories.

C. Related Requirements:

1. Division 09 Section “Moisture Vapor Emission Control.”

1.2 DEFINITIONS

A. Resinous Flooring with Waterproofing Membrane: Term “resinous flooring with waterproofing membrane” shall mean elastomeric waterproofing membrane with wear surface which withstands pedestrian traffic, resists chemicals, and prevents the passage of water under pressure and capable of spanning cracks up to 1/8 inch without failure and in accordance with ASTM C957.

1. Resinous flooring shall also protect reinforced concrete substrates and reinforcement from damages due to water penetration, water vapor transmission and chloride ion penetration.

B. Slip Resistance: Term “slip resistant” for surface finish texture for resinous flooring surfaces shall be if it achieves slip resistance required for each classification and occupancy as specified in Performance Requirements, and as determined by the Owner and the Owner’s insurance and legal counsels for slip and fall insurability and legal liability.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review flooring manufacturer's written instructions for substrate preparation and environmental conditions affecting flooring installation; including moisture mitigation.
2. Review details of integral cove bases and flooring penetrations.
3. Review floor drainage requirements, local conditions, transitions, curbs, and similar details.
4. Review flooring manufacturer's written instructions for installing flooring systems.
5. Review protection measures for adjacent construction and installed flooring.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

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1. Include manufacturer's technical data, installation instructions, and recommendations for each resinous flooring component required.

B. Sustainable Design Action Submittals:

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:

a. Leadership Extraction Practices:

1) Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
2) Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.

a) Include statement indicating costs for each product having recycled content.

b. Sourcing of Raw Materials: For products that are responsibly sourced within 100 miles of project site, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.

2. Indoor Environmental Quality, Low Emitting Materials:

a. Laboratory Test Reports: For adhesives, sealants, paints, coatings wet applied on site, indicating testing and compliance with the California Department of Public-Health (CDPH) Standard Method V1.2-2017, using the applicable exposure scenario.
b. Paints, and Coatings: For wet applied on site products, include printed statement of VOC content, showing compliance with the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016.
c. Adhesives and Sealants: For wet applied on site products, submit printed statement showing compliance with the applicable chemical content requirements of SCAQMD Rule 1168, effective July 1, 2005 and rule amendment date of October 6, 2017.
d. Alternative tests for VOC above include ASTM D2369-10; ISO 11890 part 1; ASTM D6886-03; or ISO 11890-2.
e. Methylene Chloride and perchloroethylene may not be added to paints, coating, adhesive or sealants.
f. Flooring: Submit documentation to show that 100% of flooring emissions comply with California Department of Public Health (CDPH) Standard Method V1.2-2017, using applicable exposure scenario.

3. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
4. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

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5. Supply Chain Optimization: For each product, provide documentation demonstrating that manufacturer practices comply with supply chain optimization requirements.
6. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
7. Laboratory Test Reports: For finish system, indicating compliance with requirements for low-emitting materials.
8. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

C. Samples for Initial Selection: For each type of exposed finish required.

D. Samples for Verification: For each resinous flooring system required and for each color and texture specified, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.

E. Product Schedule: Use resinous flooring designations specified, and room designations indicated on Drawings in product schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer. Manufacturer's written letter certifying that installer is properly trained in application of materials being installed and is approved for performing work of this Section.

B. Sustainable Design Informational Submittals:

1. Building Product Disclosure and Optimization - Environmental Product Declarations:

a. Submit product specific type III EPDs or Industry wide (generic) EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle-to-gate scope.

2. Building Product Disclosure and Optimization - Material Ingredients:

a. Material Ingredient Optimization: Submit at least one of the following:

1) GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
2) Cradle to Cradle: Manufacturer's published literature for the product bearing the Cradle to Cradle logo, with gold or platinum certification.
3) International Alternative Compliance Path - REACH Optimization.
4) Declare: Manufacturer's completed Product Declaration Form.
5) Other programs approved by USGBC.

3. Health Product Declaration: For each product.

C. Material Certificates: For each resinous flooring component, from manufacturer. Provide manufacturer's declaration of slip resistance or slip resistance testing indicating compliance with slip resistance requirements for classification specified.

D. Material Test Reports: For each resinous flooring system, by a qualified testing agency.

E. Field Quality-Control Reports.

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1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring to include in maintenance manuals. Submit maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface and suggested schedule for cleaning.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer (applicator) with a minimum of five (5) years' experience in applying resinous flooring systems 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, and an authorized representative who is trained and approved by flooring manufacturer.

1. Engage an installer who is certified in writing by flooring manufacturer as qualified to apply resinous flooring systems indicated and who employs only persons trained and approved by flooring manufacturer for applying resinous flooring systems indicated.

B. Mockups: Installer to build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution, and final finish and texture of resinous flooring.

1. Apply full-thickness mockups on 96-inch- (2400-mm-) square floor area indicated on Drawings.

    a. Include 96-inch (2400-mm) length of integral cove base with inside and outside corner.

2. Use mock-up to confirm and coordinate slope of floor, threshold, and intersection with floor drain.
3. Simulate finished lighting conditions for Architect's review of mockups.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 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 prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

C. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 degrees F. Maintain containers used in storage of coatings in a clean condition, free of foreign materials and residue.

1. Protect materials from freezing. Keep materials dry and storage area neat and orderly. Remove waste daily. Take necessary measures to ensure that workers and work areas

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are protected from health hazards resulting from handling, mixing, and applying the coating.

2. Stage materials in area of work 48 hours prior to beginning of work, well-ventilated area, with ambient and substrate temperature between 55 and 60 degrees F.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Maintain environmental conditions complying with flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring installation within limits recommended by the flooring manufacturer during installation and cure. Do not install under conditions outside of flooring manufacturer's written recommendations.

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 installation and for 24 hours after installation unless flooring manufacturer recommends a longer period.

1.10 WARRANTY

A. Special Warranty: Upon completion of the work, provide, flooring manufacturer's and installer's written extended warranty stating that the resinous flooring systems installed will be waterproof and free from defects including but not limited to delamination and wear through for a period of not less than five (5) years from date of Substantial Completion and that in the event that defects or leaks occur within the period stipulated, the Contractor shall, at the convenience of the Owner, effect repairs and replacements necessary to remedy defects.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by flooring manufacturer of primary materials.

B. Recycled Content: Building materials shall have an averaged recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content for Project constitutes the following percentages of material:

C. VOC Content of Interior Sealants and Sealant primers used inside the weatherproofing system shall have the following maximum VOC limits:

1. Architectural sealants: 250 g/L or less.
2. Architectural Sealant Primers for nonporous substrates: 250 g/L or less.

D. VOC Content of Resinous Flooring: Provide resinous flooring systems, for use inside the weatherproofing system, that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

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1. Resinous Flooring Base Coats: 50 g/L.
2. Resinous Flooring Topcoats: 100 g/L

E. Verify flooring products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

F. Dynamic Coefficient of Friction (DCOF): For resinous flooring installed on walkway surfaces, provide products with the following values determined by testing identical products in accordance with ANSI A326.3 using the BOT-3000 to measure slip resistance of flooring, with the following minimum classification, reference category and performance:

1. Level Surfaces and Treads:

   a. Interior, Dry (ID): ≥0.42 dry DCOF.
   b. Interior, Wet (IW): ≥0.42 wet DCOF
   c. Interior, Wet Plus (IW+): Minimum DCOF of 0.50.
   d. Exterior Wet Classification (EW): Minimum DCOF of 0.55.
   e. Oils/Greases (O/G): Minimum DCOF of 0.55.

2. Ramp Surfaces: Minimum DCOF of 0.55.

2.2 RESINOUS FLOORING

A. Resinous Flooring Systems: Abrasion-, impact-, and chemical-resistant, aggregate-filled, resin-based monolithic floor surfacing designed to produce a seamless floor; provide with integral cove base at perimeter walls, curbs, deck penetrations, and as indicated on Drawings.

1. Basis of Design: Provide products indicated on Drawings and Finish Schedules.
2. Subject to compliance with requirements, equivalent products of the following manufacturers may be considered:

   a. BASF, Master Builders Solutions
   b. Crossfield Products Corp.
   c. Dudick, Division of Carboline.
   d. Duraflex, Inc., Div. Sherwin Williams
   e. Sherwin-Williams Company.
   f. Sika Corporation.
   g. Stonhard.

B. Resinous Flooring Type **RMX-01**: Provide resinous flooring system complying with the following requirements:

1. Basis of Design: “Stonshield HRI”; Stonhard, Inc.
2. Flooring system components:

   a. Primer: Type recommended by flooring manufacturer.
   b. Stonproof ME7: Waterproofing membrane.
   c. Stonshield HRI Base: Four-component, troweled mortar base consisting of epoxy resin, curing agent, and finely graded silica aggregate.
   d. Stonshield Undercoat: Three-component, free flowing epoxy formulation consisting of resin, curing agent, pigment, and fine aggregate.
   e. Stonshield Aggregate: Brightly colored, quartz broadcast aggregate.

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f. Stonkote CE4: Two-component, high-performance, UV-resistant, clear epoxy sealer.

3. Color and Texture: As indicated by manufacturer's designations.
4. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

a. Compressive Strength: 10,000 psi after 7 days per ASTM C579.
b. Tensile Strength: 2,000 psi per ASTM C307.
c. Flexural Strength: 4,300 psi per ASTM C580.
d. Flexural Modulus of Elasticity: 2.0 x 10^6 psi per ASTM C580.
e. Hardness: 85 to 90 per ASTM D2240, Shore D.
f. Impact Resistance: > 160 in./lbs. per ASTM D2794.
g. Abrasion Resistance: 0.06 gm max. weight loss per ASTM D 4060, CS-17.
h. Flammability: Class 1 per ASTM E648.
i. Thermal Coefficient of Linear Expansion: 1.3 x 10^{-5} in./in. degrees F.
j. Water Absorption: 0.1% per ASTM C 413
k. VOC Content per ASTM D2369:

1) Stonshield HRI Base – 40 g/l.
2) Stonshield Undercoat – 34 g/l.
3) Stonkote CE4 – 34 g/l.

l. Cure Rate at 77 degrees F/25 degrees C: 12 hours foot traffic, 24 hours normal operations.

2.3 INTEGRAL COVE BASE ACCESSORIES

A. Precast, Integral Cove Base: Impact-resistant, polymer-resin, cove base moldings with a grit profile to promote adhesion of resinous flooring and recommended in writing by flooring manufacturer.

1. Radius Cove Base: Base high base molding that provides approximately 1-inch (25-mm) radius cove at floor-to-wall joint; for adhesive installation as substrate for resinous flooring system to form an integral cove base.

a. Nominal Base Height: As indicated on Drawings.

2. Preformed Inside and Outside Corners: Manufacturer's standard units; shop- or field-mitered for project conditions and applications.

B. Installation Adhesive: Type recommended in writing by accessory manufacturer.

1. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

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2.4 ACCESSORY MATERIALS

A. Patching and Fill Material: Moisture, mildew, and alkali resistant product recommended in writing by flooring manufacturer with a minimum of 3000 psi compressive strength after 28 days when tested according to ASTM C109.

B. Crack-Filling Material: Resin-based material recommended in writing by flooring manufacturer for sealing concrete substrate crack repair.

C. Joint Sealant: Type recommended by flooring manufacturer for type of service and joint condition indicated.

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.

1. 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 resinous flooring.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrates in accordance with flooring manufacturer's written instructions for substrate indicated to ensure adhesion. Provide clean, dry, and neutral Ph 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 contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:

   a. 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.
   b. Comply with requirements in SSPC-SP 13/NACE No. 6, with a Concrete Surface Profile of 3 or greater in accordance with ICRI Technical Guideline No. 310.2R, unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete in accordance with flooring manufacturer's written instructions.
3. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three (3) tests in each installation area and with test areas evenly spaced in installation areas.

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a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lbs. of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

4. Alkalinity and Adhesion Testing: Perform tests recommended in writing by flooring manufacturer. Proceed with installation only after substrate alkalinity is not less than 6 or more than 8 pH unless otherwise recommended in writing by flooring manufacturer,

C. Protect walls, floor openings, electrical openings, door frames, and other obstructions during installation.

D. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates in accordance with flooring manufacturer's written instructions.

1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through flooring in accordance with flooring manufacturer's written instructions.

E. Patch cracks in substrates to receive flooring with materials and methods to prevent cracks telegraphing through the finished flooring. Fill all depressions and irregularities to produce a flat to plane floor.

1. Positive Drainage: In rooms with floor drains or drainage trenches, hose test and marble test flooring substrates to identify all flooring areas which retain liquids. Patch all liquid retention areas and provide a free draining substrate. Retest and repair until liquids drain freely from all locations.

F. Verify that positive ventilation is available to exhaust air from spaces to receive flooring to the outside of the building, and work areas are properly sealed to prevent smell and odors from leaving the room or affecting adjacent spaces.

G. Resinous Materials: Mix components and prepare materials in accordance with flooring manufacturer's written instructions.

H. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through flooring according to flooring manufacturer's written recommendations.

3.3 INSTALLATION – GENERAL

A. General: Apply components of resinous flooring system in accordance with flooring manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness specified.

1. Coordinate installation of components to provide optimum adhesion of flooring to substrate, and optimum intercoat adhesion.
2. Cure flooring components in accordance with flooring manufacturer's written instructions. Prevent contamination during installation and curing processes.
3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with flooring manufacturer's written instructions.

a. Apply joint sealant to comply with manufacturer's written recommendations.

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B. Primer: Apply primer over prepared substrate at spreading rate recommended in writing by flooring manufacturer.

C. Waterproofing Membrane: Apply waterproofing membrane in thickness recommended in writing by flooring manufacturer.

1. Apply waterproofing membrane to integral cove base substrates. Turn membranes up walls and penetrations a minimum of 6 inches vertically behind integral bases. Overlap drain bodies and contiguous work.

D. Extend flooring into recesses, floor drains, over mechanical equipment bases, and under equipment in the spaces indicated to receive flooring. Include integral cove bases, raised bases and depressions to form a complete monolithic covering without interruptions or seams. Place and finish flooring neatly around obstructions, in a manner that will achieve uniform color and texture and water tightness throughout.

E. Integral Cove Base Accessories: Adhesively install precast accessories before applying flooring coats and in accordance with manufacturer's written instructions.

F. Self-Leveling Body Coats: Apply self-leveling slurry body coats in minimum thickness recommended by flooring manufacturer.

G. Troweled or Screeded Body Coats: Apply troweled or screeded body coats in minimum thickness recommended by flooring manufacturer. Hand or power trowel and grout to fill voids. When body coats are cured, remove trowel marks and roughness using method recommended in writing by manufacturer.

H. Grout Coats: Apply grout coat of type recommended by flooring manufacturer, to fill voids in surface of final body coat.

I. Aggregates: Broadcast aggregates at rate recommended in writing by flooring manufacturer. After resin is cured, remove excess aggregates to provide surface texture indicated.

J. Topcoats: Apply topcoats in number recommended by flooring manufacturer, at spreading rates recommended in writing by flooring manufacturer, and to produce wearing surface specified.

3.4 APPLICATION

A. Comply with flooring manufacturer's written instructions for mixing and preparing materials and as applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.

1. After completing coating operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, incompatible coatings, and loose substrate materials.

D. Cementitious and Masonry Surfaces: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

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E. Crack Repair: Fill cracks according to flooring manufacturer's written instructions before coating surfaces.

1. Cracks Larger Than 1/32 Inch: Cut out static cracks, voids, or honeycombing larger than 1/32 inch and patch with materials recommended in writing by manufacturer. Identify dynamic cracks and treat according to manufacturer's written instructions before beginning application.

F. Apply flooring materials according to flooring manufacturer's written instructions. Use applicators and techniques suited for applying flooring materials to substrates and surfaces indicated.

G. Apply flooring materials to achieve material thickness as recommended in writing by flooring manufacturer.

1. Apply additional coats when undercoats or other conditions show through final coat until cured film is of uniform coating finish, color, and appearance.

H. On previously coated surfaces, apply flooring materials to achieve material thickness as recommended in writing by flooring manufacturer.

1. Apply additional coats when undercoats or other conditions show through final coat until cured film is of uniform coating finish, color, and appearance.

I. Non-Slip Finishes: Provide non-slip textures and finishes at all flooring applications.

3.5 FIELD QUALITY CONTROL

A. Material Sampling: Owner may, at any time and any number of times during resinous flooring installation, require material samples for testing for compliance with requirements.

1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.

a. Testing agency shall measure thickness with wet film thickness notch gauge or other suitable device in accordance with ASTM D4114 at least once for every 600 sq. ft. and include measurements in reports.
b. Where testing occurs after installation, measure resinous flooring thickness using test cut and micrometer in accordance with ASTM D1005, or using non-destructive dry film thickness (DFT) gauge or meter using ultrasonic technology in accordance with ASTM D6132 or ASTM D3730 as applicable and as approved by the Architect. Where the test cut and micrometer method is employed, repair areas where test cuts were made according to resinous flooring manufacturer's written instructions.

3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reinstall flooring materials to comply with requirements.

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3.6 PROTECTION

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.

END OF SECTION 096723

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SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Modular carpet tile.

C. Related Requirements:

1. Division 09 Section “Moisture Vapor Emission Control” for slab preparation prior to installation.
2. Division 09 Section "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.2 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.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product to include the following:

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Sustainable Design Submittals:

1. Product Data: For adhesives onsite indicating VOC content.

2. Laboratory Test Reports: For adhesives onsite indicating compliance with requirements for low-emitting materials.

3. Laboratory Test Reports: For flooring products onsite indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For carpet tile installation, plans showing the following:

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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.

D. Samples for Verification: 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- (300-mm-) long Samples.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sustainable Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).

2. Product Data: For recycled content of product, separately identifying the percentage of pre-consumer (post-industrial) recycled content and percentage of post-consumer recycled content.

3. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.

4. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

C. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

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1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups at locations and in sizes 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.

1.8 DELIVERY, STORAGE, AND HANDLING

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

1.9 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

a. More than 10 percent edge raveling, snags, and runs.
b. Dimensional instability.
c. Excess static discharge.

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d. Loss of tuft-bind strength.
e. Loss of face fiber.
f. Delamination.

3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Refer to Finish Legend for Manufacturers, Colors, and Patterns.

B. Color: As selected by Architect from manufacturer's full range.

C. Pattern: Match Architect's samples.

D. Product Certification: Carpet to be CRI Green Label Plus, CDPH compliant, or equivalent.

E. Low-Emitting Materials:

1. Flooring products on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.

2. Adhesives on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.

3. Adhesives on site must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4 BD+C."

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 comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation. Adhesive to have a maximum VOC of 50 g/L.

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.

B. Examine carpet tile for type, color, pattern, and potential defects.

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C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb. of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes, and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Partial glue down; install periodic tiles with releasable, pressure-sensitive adhesive.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns indicated on Drawings and as recommended in writing by carpet tile manufacturer.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

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F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

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SECTION 096900 - ACCESS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Cementitious-core steel panel access flooring.

C. Related Requirements:

1. Division 09 Section “Resilient Flooring” for static-dissipative flooring finish for access flooring panels.

1.2 COORDINATION

A. Coordinate location of mechanical and electrical work in underfloor cavity to prevent interference with access flooring.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review connections between access flooring and mechanical and electrical systems.
2. Review requirements related to sealing the plenum.
3. Review procedures for keeping underfloor space clean.

1.4 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 access flooring.
2. Include loading capacities.

B. Shop Drawings: For access flooring:

1. Include layout of access flooring and relationship to adjoining Work based on field-verified dimensions.
2. Details and sections with descriptive notes indicating materials, finishes, fasteners, typical and special edge conditions, accessories, and understructures.

C. Samples for Verification: For the following products:

1. Floor Coverings: Full-size units.
2. Exposed Metal Accessories: Approximately 10 inches (250 mm) in length.
3. One full-size floor panel for each type of access flooring required.

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1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of access flooring.

C. Seismic Design Calculations: For seismic design of access flooring, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Panels: 2 percent or 10 floor panels, whichever is greater.

1.7 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, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical access flooring, as shown on Drawings. Size to be an area no fewer than five floor panels in length by five floor panels in width.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install access flooring until ambient temperature is between 50 and 90 deg F (10 and 32 deg C), and relative humidity is not less than 20 and not more than 70 percent.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide access flooring panels capable of complying with the following performance requirements according to testing procedures in CISCA's "Recommended Test Procedures for Access Floors":

1. Concentrated Loads: 1000 lbf (4448 N) with the following deflection and permanent set:

a. Top-Surface Deflection: 0.10 inch (2.54 mm).
b. Permanent Set: 0.010 inch (0.25 mm).

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2. Ultimate Loads: 1800 lbf (8006 N).
3. Rolling Loads: With local or overall deformation not to exceed 0.040 inch (1.02 mm).

    a. CISCA Wheel 1: 10 passes at 400 lbf (1779 N).

4. Drop Impact Load Test: 100 lb (45.5 kg).

B. Fire Performance:

1. Surface-Burning Characteristics: Comply with ASTM E84; 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 CEMENTITIOUS-CORE STEEL PANEL ACCESS FLOORING (AF-01)

A. Fabricate panels from cold-rolled steel sheet, with die-cut flat top sheet and die-formed and stiffened bottom pan welded together. Protect metal surfaces against corrosion using manufacturer's standard factory-applied finish. Fully grout internal spaces of completed units with manufacturer's standard cementitious fill.

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

    a. ASM Modular Systems, Inc.; “FS100D.”
    b. Global IFS; “TecCrete TC 1250.”
    c. Tate Access Floors, Inc; “ConCore 1000.”

2. Configuration: Provide modular panels with nominal size of 24 by 24 inches (610 by 610 mm), interchangeable with other field panels without disturbing adjacent panels or understructure.
3. Attachment to Understructure: Bolted.

B. Perforated Panels: Perforated top surface with slots of number, spacing, and size standard with manufacturer to produce a nominal open area of 25 percent. Provide mechanical dampers with each panel unit.

1. Quantity: As indicated on Drawings.
2. Finish: To match solid panels.

C. Pedestal System Understructure: System consisting of base, column with provisions for height adjustment, and head (cap); made of steel.

1. Base: Square or circular base with not less than 16 sq. in. (103 sq. cm) of bearing area.
2. Column: Of height required to bring finished floor to elevations indicated. Weld column to base plate.
3. Provide vibration-proof leveling mechanism for making and holding fine adjustments in height over a range of not less than 2 inches (51 mm) and for locking at a selected height, so deliberate action is required to change height setting and prevent vibratory displacement.
4. Head: Designed to support the floor panel indicated.

    a. Bolted Assemblies: Provide head with four holes aligned with holes in floor panels for bolting of panels to pedestals.

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D. Floor Finish: Provide factory-applied floor finish fabricated in one piece to cover entire panel face; with integral trim edging.

1. Static-Dissipative Vinyl Tile: ASTM F1700, Class I (Monolithic Vinyl Tile), Type A (Smooth Surface).

a. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following:

1) Flexco.
2) VPI Corporation.

b. Electrical Resistance: Average no less than 1 megohm and no more than 1000 megohms when installed floor coverings are surface-to-ground tested according to ASTM F150 with 100-V applied voltage.
c. Colors, Textures, and Patterns: Match Architect's samples.

2.3 FABRICATION

A. Fabrication Tolerances:

1. Size: Plus or minus 0.020 inch (0.50 mm) of required size.
2. Squareness: Plus or minus 0.015 inch (0.38 mm) between diagonal measurements across top of panel.
3. Flatness: Plus or minus 0.035 inch (0.89 mm), 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. Bolted Panels: Provide panels with holes drilled in corners to align precisely with threaded holes in pedestal heads and to accept countersunk screws with heads flush with top of panel.

1. Captive Fasteners: Provide fasteners held captive to panels.

D. 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. Grommets: Where indicated, fit cutouts with manufacturer's standard grommets; or, if size of cutouts exceeds maximum grommet size available, trim edge of cutouts with manufacturer's standard plastic molding with tapered top flange. Furnish removable covers for grommets.
3. Provide foam-rubber pads for sealing annular space formed in cutouts by cables.

2.4 ACCESSORIES

A. Adhesives: Manufacturer's standard adhesive for bonding pedestal bases to subfloor.

1. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

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B. Post-Installed Anchors: For anchoring pedestal bases to subfloor, provide two post-installed expansion anchors made from carbon-steel components, zinc plated to comply with ASTM B633, 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 E488/E488M, conducted by a qualified independent testing agency.

C. Fascia Closures: Where underfloor cavity is not enclosed by abutting walls or other construction, provide metal closure plates with manufacturer's standard finish.

D. Ramps: Manufacturer's standard ramp construction of width and slope indicated, but not steeper than 1:12, with raised-disc or textured rubber or vinyl-tile floor coverings, and of same materials, performance, and construction requirements as access flooring.

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. Railings: Standard extruded-aluminum railings at ramps and open-sided perimeter of access flooring where indicated. Include handrail, intermediate rails, posts, brackets, end caps, wall returns, wall and floor flanges, plates, and anchorages where required.

G. Panel Lifting Device: Panel manufacturer's standard portable lifting device for each type of panel required.

H. 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 authorized 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 conditions and deleterious substances 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 (152 mm).

B. Locate each pedestal, complete any necessary subfloor preparation, and vacuum subfloor to remove dust, dirt, and construction debris before beginning installation.

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3.3 INSTALLATION

A. Install access flooring 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; and as required to meet seismic design requirements.

C. Adjust pedestals so installed panels are flat, level, and at the proper height.

D. Stringer Systems: Secure stringers to pedestal heads according to access-flooring manufacturer's written instructions.

E. Install flooring panels securely in place, leaving them properly seated with panel edges flush. Do not force panels into place.

F. Scribe perimeter panels to provide a close fit, with adjoining construction having no voids greater than 1/8 inch (3 mm) 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.

G. 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 installed access flooring.

H. Grounded Access Flooring: Ground access flooring as recommended by manufacturer and as needed to comply with performance requirements for electrical resistance of floor coverings.

1. Panel-to-Understructure Resistance: Not more than 10 ohms as measured without floor coverings.

I. Closures: Scribe closures to closely fit against subfloor and adjacent finished-floor surfaces. Set in mastic and seal to maintain plenum effect within underfloor cavity.

J. Clean dust, dirt, and construction debris caused by floor installation, and vacuum subfloor area as installation of floor panels proceeds.

K. Seal underfloor air cavities at construction seams, penetrations, and perimeter to control air leakage, according to manufacturer's written instructions.

L. Install access flooring without change in elevation between adjacent panels and within the following tolerances:

1. Plus or minus 1/16 inch (1.5 mm) in any 10-foot (3-m) distance.
2. Plus or minus 1/8 inch (3 mm) 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.

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B. Replace access-flooring panels that are stained, scratched, or otherwise damaged or that do not comply with specified requirements.

END OF SECTION 096900

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SECTION 097200 - WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Vinyl wall covering.
2. Felted-fiber wall covering.
3. Textile wall covering.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
2. Product Data: For adhesives, indicating VOC content.

A. Sustainable Design Submittals:

1. Product Data: For adhesives indicating VOC content.
2. Laboratory Test Reports: For adhesives indicating compliance with requirements for low-emitting materials.

B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement, seams, and termination points.

C. Samples for Verification: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36-inch- (914-mm-) long in size.

1. Wall-Covering Sample: From same production run to be used for the Work. Show complete pattern repeat. Mark top and face of fabric.

D. Product Schedule: For wall coverings. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Sustainable Design Submittals:
1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Sourcing: For recycled content of product, separately identifying the % of pre-consumer (post-industrial) recycled content and % of post-consumer recycled content.

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3. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
4. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

C. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wall-Covering Materials: For each type, color, texture, and finish, full width by length to equal to 5 percent of amount installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual experienced in installing wall coverings similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for installation.

1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F1141 for appearance shading characteristics.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.

B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.

C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Surface-Burning Characteristics: Comply with ASTM E84; 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. Fire-Growth Contribution: No flashover and heat and smoke release according to NFPA 265 and NFPA 286.

B. Mildew Resistance: As applicable to each type of wall covering, with rating of zero or 1 when tested in accordance with ASTM G21.

C. Low-Emitting Materials:

1. Adhesives on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. Adhesives products on site must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4 BD+C."

2.2 VINYL WALL COVERING

A. Refer to Finish Schedule for Manufacturers, Colors, and Patterns.

B. Color: As selected by Architect from manufacturer's full range.

C. Pattern: Match Architect's samples.

2.3 FELTED-FIBER WALL COVERING

A. Refer to Finish Schedule for Manufacturers, Colors, and Patterns.

B. Color: As selected by Architect from manufacturer's full range.

C. Pattern: Match Architect's samples.

2.4 TEXTILE WALL COVERING

A. Refer to Finish Schedule for Manufacturers, Colors, and Patterns.

B. Color: As selected by Architect from manufacturer's full range.

C. Pattern: Match Architect's samples.

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2.5 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.

1. Adhesives shall have a VOC content of 50 g/L or less.

B. Primer/Sealer: Mildew resistant, recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.

C. Wall Liner: Nonwoven, synthetic underlayment, and adhesive as recommended in writing by wall-covering manufacturer.

1. Adhesives shall have a VOC content of 50 g/L or less.

D. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.

C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.

1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
2. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
3. Painted Surfaces: Treat areas susceptible to pigment bleeding.

D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.

E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

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3.3 WALL LINER INSTALLATION

A. Install wall liner, without gaps or overlaps. Form smooth wrinkle-free surface for finished installation. Do not begin wall-covering installation until wall liner has dried.

3.4 WALL-COVERING INSTALLATION

A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.

B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.

C. Install strips in same order as cut from roll.

1. For solid-color, even-texture, or random-match wall coverings, reverse every other strip.

D. Install wall covering without lifted or curling edges and without visible shrinkage.

E. Install seams vertical and plumb at least 6 inches (150 mm) from outside corners and 6 inches (150 mm) from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.

F. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.

G. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.5 CLEANING

A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended in writing by wall-covering manufacturer.

C. Replace strips that cannot be cleaned.

D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 097200

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SECTION 097815 – WOOD INTERIOR WALL PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Interior prefabricated wood wall paneling.

C. Related Requirements:

1. Division 09 Section "Gypsum Board Assemblies" for reinforcement in walls and partitions scheduled as substrates for paneling.

D. Single Subcontract Responsibilities: Work specified elsewhere that is part of the work of this section includes, but is not limited to, applicable portions of the following:

1. Division 09 Section "Suspended Wood Ceilings."

1.2 COORDINATION

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

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Wall panels.
2. Mounting accessories.

A. Sustainable Design Submittals:

1. Product Data: For adhesives indicating VOC content.
2. Laboratory Test Reports: For adhesives indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For wall products, indicating compliance with requirements for low-emitting materials.

B. Shop Drawings: Show location of each item, including the following:

1. Dimensioned plans, elevations, sections, and attachment details.

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2. Attachment devices, and other components.
3. Show full-size details.
4. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.
5. Wall mounted items.
6. Penetrations through wall; trim and moldings.

C. Samples for Verification:

1. Wood Wall Panels: 12-inch-long by 12-inch-wide or full-width Samples of each type, color, and finish.
2. Exposed Molding and Trim: 12-inch-long Samples of each type, color, and finish.
3. Veneer Edge Banding: Applied to a cut end of a wall panel Sample for each type, color, and finish.

1.5 INFORMATIONAL SUBMITTALS

A. Sustainable Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Sourcing: For recycled content of product, separately identifying the % of pre-consumer (post-industrial) recycled content and % of post-consumer recycled content.
3. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
4. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

B. Qualification Data: For wall paneling manufacturer and Installer.

C. Product Certificates: For each type of product.

D. Evaluation Reports: For fire-retardant-treated wood materials, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Single-Source Manufacturing and Installation Responsibility: Engage a qualified Manufacturer to assume undivided responsibility for wood paneling specified in this section, including fabrication, finishing, and installation.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups of wall paneling wall panels as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver interior wall paneling until painting and similar operations that could damage woodwork have been completed in installation areas.

B. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

A. Environmental Limitations for Interior Work without Humidity Control: Do not deliver or install interior wall paneling until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupancy for the remainder of the construction period.

B. Field Measurements: Where wall paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.

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

PART 2 - PRODUCTS

2.1 WALL PANELING MANUFACTURERS

A. Source Limitations: Provide wall paneling manufactured by same entity as that furnishing wood ceiling panels.

2.2 WOOD-VENEER WALL PANELING

A. Wood Panels: Manufacturer's standard panels consisting of real wood veneer laminated to a fiberglass reinforced polymer.

B. Manufacturer:

1. Basis of Design Manufacturer: SoundPly; Navy Island Inc.

a. Address: 275 Marie Avenue E, St. Paul, MN 55118.
b. Telephone. (651) 451-4454.
c. Email: sales@navyisland.com.

C. Performance:

1. Surface-Burning Characteristics: Provide products with the following characteristics when tested in accordance with ASTM E84:

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a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

2. Acoustic Performance, Alta WP-LRM19:
    1) 0.70 NRC.
    2) CAC: 39.

3. Dimensional Stability: Linear contraction or expansion to not exceed 0.4% maximum variation in width or height when tested in accordance with ASTM D1037.
4. VOC Emissions: Third party certified for compliance with CDPH 01350 for volatile organic compounds.

D. Materials:

1. Latus WP-LR-M19: 3/4-inch thick acoustical panels constructed with real wood veneer laminated to a fiberglass reinforced polymer.

    a. Surface Skin Thickness: Minimum of 1.5 mm (0.060 inch).
    b. Core: Comprised of a Class A sintered resin-reinforced glass wool. Incorporate manufacturer’s standard rigid, acoustically reflective center barrier.
    c. Perforations: Furnish baffles with perforated faces consisting of 0.5mm (0.02”) diameter holes in an offset pattern.

        1) Fabricate perforations must without rounded edges or grain pull out between perforations.
        2) Ensure a minimum of 99.5 percent of the perforations are acoustically functional, providing unobstructed passage into the core.

    d. Panel Edge Treatment: Edgeband panels with matching materials and finish.

        1) Contrasting Material: As indicated on Drawings.

    e. Panel Weight: 1.4 lb / sq ft.
    f. Panel Sizes: As indicated on Drawings.
    g. Panel Length: As indicated on Drawings.
    h. Veneers: Shop-applied, clear.

        1) Species: As indicated on Drawings.
        2) Cut: Quartered/rift.

E. Wood-Panel Accessories: Wood-panel manufacturer's accessories required to provide a complete installation of wall paneling in accordance with manufacturer's written installation instructions.

F. Aluminum “Z” clips and trim to be manufactured or selected specifically to meet the following requirements:

1. Handle the weight of wall panels.
2. Fasteners for panel assembly to be designed to keep panels consistently flat at each joint.
3. Capable of holding panels up to 6’ high x 12’ wide.
4. Allowing a 1/4" ventilation gap between the wall and the back side of the panel clip, to prevent condensation behind the panels.

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5. System to allow interchanging of components at a later date, with a dryfit installation. Do not use liquid adhesives.

2.3 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, Hanging Strips, and Nailers: Softwood or hardwood lumber, fire-retardant treated, kiln dried to less than 15 percent moisture content.

B. Fire-Retardant Treatment: Complying with requirements; provide where indicated on Drawings.

C. Installation Adhesive: Product recommended by fabricator for each substrate for secure anchorage.

D. Adhesives wet-applied on site shall meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.

2.4 FABRICATION

A. Fabricate wall paneling to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and finishing, to maximum extent possible before shipment to Project site.

C. Disassemble components only as necessary for shipment and installation.

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

E. Notify Architect seven days in advance of the dates and times wall paneling fabrication will be complete.

F. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.

1. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.
2. Verify that parts fit as intended, and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition wall paneling to average prevailing humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.

B. Before installing wall paneling, examine shop-fabricated work for completion, and complete work as required, including removing packing and backpriming concealed surfaces.

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3.2 INSTALLATION

A. Assemble wall paneling, and complete fabrication at Project site to the extent that it was not completed during shop fabrication.

B. Install wall paneling level, plumb, true in line, and without distortion.

1. Shim as required with concealed shims.
2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
3. Scribe and cut wall paneling to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
4. Anchor wall paneling to anchors or blocking built in or directly attached to substrates.

3.3 REPAIR

A. Repair damaged and defective wall paneling to eliminate functional and visual defects, where possible, as recommended by manufacturer.

B. Where not possible to repair, replace defective Work.

END OF SECTION 097815

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SECTION 098433 - SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Shop-fabricated, sound-absorbing wall panels.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include felt material, and mounting indicated.

B. Sustainable Design Submittals:

1. Product Data: For adhesives indicating VOC content.
2. Laboratory Test Reports: For adhesives indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For unit assembly and installation.

1. Include plans, elevations, sections, and mounting devices and details.
2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections.
3. Include details at cutouts and penetrations for other work.

D. Samples for Verification: For the following products:

1. Felt Materials: 12-inch-square sample at corner for each panel type and color.
2. Mounting Devices: Full-size Samples.
3. Assembled Panels: Approximately 36 by 36 inches, including joints and mounting methods.

1.4 INFORMATIONAL SUBMITTALS

A. Sustainable Design Submittals:

1. Product EPDs: For materials, indicating product-specific type III or Industry wide (generic).
2. Product Sourcing: For recycled content of product, separately identifying the % of pre-consumer (post-industrial) recycled content and % of post-consumer recycled content.

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3. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.
4. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).

B. Coordination Drawings: Elevations 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. Items penetrating or covered by units including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Alarms.
    e. Sprinklers.
    f. Access panels.

3. Show operation of hinged and sliding components covered by or adjacent to units.

C. Sustainable Design Submittals:

1. Environmental Product Declaration (EPD): For each product.

D. Product Certificates: For each type of unit.

E. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of unit to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.

1. Build mockup of typical wall area, including full width by full height panels.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

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1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and 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 units until a permanent level of lighting is provided on surfaces to receive the units.

C. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to the following:

a. Acoustical performance.
b. Color fastness.

2. Warranty Period: Twenty years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall units specified in this Section from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, 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 E84 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. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

B. Low-Emitting Materials:

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1. Adhesives on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. Adhesives products on site must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4 BD+C."

2.3 SOUND-ABSORBING WALL UNITS

A. Sound-Absorbing Wall Panels: Manufacturer's standard panel construction consisting of high-resolution woodgrain images applied to sound-absorbing felt.

1. Basis of Design: Provide products indicated on Drawings and Finish Schedule.
2. Mounting: Back mounted with manufacturer's standard metal clips or bar hangers, secured to substrate.
3. Panels: 100 percent polyester felt board; 1/2-inch nominal thickness material.
4. Edge Profile: Square.
5. Panel Widths: As indicated on Drawings.
6. Panel Heights: As indicated on Drawings.
7. Panel Arrangements and Configurations: As indicated on Drawings.
8. Panel Acoustical Properties: NRC: 0.45.

B. Accessories:

1. Mounting Devices: Concealed on back of panel units, recommended by manufacturer to support weight of panels, and as follows:

    a. Metal Clips or Bar Hangers: Manufacturer's standard two-part metal "Z" clips, with one part of each clip mechanically attached to back of unit and the other part to substrate, designed to permit unit removal.

2.4 FABRICATION

A. Standard Construction: Use manufacturer's standard construction.

B. 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.
5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 INSTALLATION

A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

C. Align wood image facing pattern and grain with adjacent units.

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb and Level: Plus or minus 1/16 inch in 48 inches, noncumulative.

B. Variation of Joint Width: Not more than 1/32-inch variation from reveal line in 48 inches, noncumulative.

3.4 CLEANING

A. Clip loose threads; remove pills and extraneous materials.

B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 098433

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SECTION 098453 - SOUND BARRIER MULLION TRIM CAPS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Sound barrier mullion trim caps providing sound transmission control at junction of partition and curtain wall.

C. Related Requirements:

1. Division 07 Section "Joint Sealants" for joint sealing.
2. Division 08 Sections for curtain wall construction.
3. Division 09 Section "Gypsum Board Assemblies" for interior wall construction

1.2 ACTION SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sound barrier wall end cap system.

B. Shop Drawings:

1. Include typical dimensioned cross-section(s) at the location where drywall partition terminates at the perimeter curtain wall, indicating:

a. Dimensions.
b. Finishes.

C. Samples: For each exposed product and for each color and texture specified.

1. Size: 6 inch (152 mm) sound barrier mullion trim cap sample and 2” by 3-1/2” (51 mm x 89 mm) custom color paint sample.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each sound barrier mullion trim cap assembly, for ASTM E90 tests performed by a qualified third party testing agency.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of aluminum extrusions and anodizing shall be ISO-9001 certified.

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B. Installer Qualifications: An entity that employs installers and supervisors who are approved by manufacturer.

C. Testing Agency Qualifications: ASTM E90 testing to be performed by laboratory accredited by IAS as complying with ISO/IEC Standard 17025.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver sound barrier mullion trim caps until spaces to receive them are clean, dry, and ready for their installation.

B. Store sound barrier mullion trim caps in original undamaged packaging inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace sound barrier mullion trim caps that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Ten years limited warranty from date of Substantial Completion.
2. Limited warranty does not cover adjacent products or improper installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Mull-It-Over Products**;** Sound barrier mullion trim cap systems.

a. Tel: (616) 730-2162.
b. Web Address: www.mullitoverproducts.com.

2.2 SYSTEM DESCRIPTION

A. General: Provide sound barrier mullion trim caps of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.

1. Furnish units in lengths of sufficient additional length to allow for field trimming to required length to match variations in construction tolerances of adjacent systems.

2.3 PERFORMANCE REQUIREMENTS

A. Sound Transmission:

1. Single Sided Installations: STC 50 or higher.
2. Double-Sided Installations: STC 55 or higher.

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B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Mullion trim cap to be sized to accommodate thermal movement.

2.4 SOUND BARRIER MULLION TRIM CAP

A. Sound Barrier Mullion Trim Cap:

1. Products: MULL-it-OVER Products**;** Mullion Trim Cap.

B. Profile: 55 Classic Mullion Trim Cap.

2.5 COMPONENTS

A. Aluminum Extrusions:

1. Thickness: 0.125 inches.
2. Profile: As selected and approved by Architect to allow solid attachment and fastening to the partition wall framing.

B. Sound Absorbing Foam:

1. Resistant to smoke, flame, and microbial growth.
2. Fire Rating: ASTM E84 Class 1.
3. Fungi Resistance: Zero rating per ASTM G21.

C. Compressible Foam: Between edge of extrusion and interior face of curtain wall glass.

1. Thickness: Standard 1/2 inch (12.7 mm), 3/4-inch (19.1 mm), 1 inch (25.4 mm) or 1-1/2-inches (38.1 mm) as required to accommodate mullion deflection.
2. Color: Light gray.

D. Fasteners:

1. Self Tapping or appropriate threaded fasteners.
2. Compatible with all materials fasteners will be in contact with, and not causing galvanic corrosion.

E. Snap Cover: Snap-on fastener cover.

F. Acoustical Sound Sealant: Acrylic latex based.

G. Low-Emitting Materials:

1. Adhesives on site must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. Adhesives products on site must have VOC content in compliance with the applicable VOC limits (g/L) found in Division 01 Section 018113 "Sustainable Design Requirements - LEED v4 BD+C."

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2.6 ACCESSORIES

A. Provide necessary and related parts and tools to complete installation.

2.7 FABRICATION

A. Extrusions and generic profiles to be shipped in custom lengths as required to meet project requirements or shipped in standard incremental foot lengths and cut to exact length on jobsite.

2.8 FINISHES

A. Exposed surfaces of exposed aluminum extrusion:

1. Standard Finish: Supplied in clear anodized finish.
2. Custom Finish: Custom anodized finishes and painted finishes available upon request.

B. Finishes:

1. Aluminum - clear anodize:

a. Clear anodized finish in accordance with AA-M10 C22 A41 Class I (0.7 to 1.0 thick anodic coating)

2. Aluminum - color anodize or painted:

a. Color Choice with matte or bright finish. Select from manufacturer's custom color offering.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine walls and adjacent curtain wall for suitable conditions where sound barrier wall end cap will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Measure and cut sound barrier wall end cap to proper lengths.

B. Notch around horizontal mullions, sills, or other obstructions leaving appropriate gap for differential movement between the sound barrier wall end cap and the obstruction.

C. Apply continuous bead of acoustical sealant to the unexposed side of extruded aluminum surface that will be in contact with the drywall edge.

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D. Place sound barrier wall end cap on the vertical surface of the drywall partition wall and loosely install fasteners in the top and bottom slotted holes of the wall end cap.

E. Plumb the wall end cap leaving recommended gap spacing between the interior glass surface and the wall end cap. Foam gasket to be in contact with glass.

F. Tighten top and bottom fasteners to secure end cap.

G. Install additional fasteners at 12 inches on center, minimum.

H. Install snap cover to conceal fasteners.

I. Apply color matched sealant at joints of dissimilar materials as desired.

3.3 CLEANING

A. After work is complete in adjacent areas, clean exposed surfaces with suitable cleaner that will not harm or attack the finish.

3.4 PROTECTION

A. Protect sound barrier wall end caps from damage during installation, general construction activities, and until turnover of structure.

END OF SECTION 098453

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SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents

B. Section includes, but is not limited to:

1. Fixed glass markerboard units.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.

B. Shop Drawings: For visual display units.

1. Include plans, elevations, sections, details, and attachment to other work.
2. Show locations of panel joints.
3. Show locations and layout of special-purpose graphics.
4. Include sections of typical trim members.

C. Samples: For each type of visual display unit indicated.

1. Visual Display Panel: Not less than 8-1/2 by 11 inches (215 by 280 mm), with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.
2. Trim: 6-inch- (150-mm-) long sections of each trim profile.
3. Display Rail: 6-inch- (150-mm-) long section of each type.
4. Support System: 6-inch- (150-mm-) long sections.
5. Accessories: Full-size Sample of each type of accessory.

D. Product Schedule: For visual display units. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranties: For manufacturer's special warranties.

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1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display units 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.8 FIELD CONDITIONS

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

1.9 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel 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.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FRAMED GLASS MARKERBOARDS

A. Manufacturers and products: provide one of the following or equal:

1. (Basis of Design) Clarus Glassboards, LLC.

B. Glass Markerboards: 1/4-inch tempered PPG "Starfire" glass markerboard, with smooth polished edges and eased corners; color coated on back surface.

C. Fixed Unit Mounting: “Float” mounting style with concealed mounting hardware and anchors per manufacturer.

D. Color and Surface: As indicated on Drawings.

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E. Size: As indicated on Drawings.

F. Materials:

1. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
2. Frame: Refer to Schedule on the drawings.

2.2 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

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

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.3 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

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 of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display units.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

3.3 INSTALLATION

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.

3.4 CLEANING AND PROTECTION

A. Clean visual display units in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.

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B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display units after installation and cleaning.

END OF SECTION

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SECTION 101400 - WAYFINDING SIGNAGE

1.1 SUMMARY

A. Section Includes:

1. Panel signage, including:

a. Panel signs.
b. Painted Room Signs.

1.2 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.3 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.4 FIELD CONDITIONS

A. Field Measurements:

1. Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.5 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: The Department of Justice 2010 ADA Standards, as well as IBC and ICC/ANSI A117.1 or other locally enforced accessibility standards.

1.6 PANEL SIGNS

A. Match existing signage system signage.

B. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Solid-Sheet Sign, Returns, and Back: Sheet materials and thicknesses as indicated on Drawings.

a. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.

2. Sign-Panel Perimeter: Finish edges smooth.
3. Mounting: As indicated on Drawings with concealed anchors, countersunk flathead through fasteners, adhesive, two-face tape, or magnetic tape.
4. Surface Finish and Applied Graphics:

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a. Baked-Enamel or Powder-Coat Finish and Graphics: Colors indicated on Drawings.
b. Overcoat: Manufacturer's standard baked-on clear coating.

5. Text and Typeface: Accessible raised characters and Braille. Finish raised characters to contrast with background color as indicated on Drawings, and finish Braille to match background color.
6. Flatness Tolerance: Sign shall remain flat or uniformly curved under installed conditions as indicated on Drawings and within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

1.7 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.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

1.8 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. Exposed Metal-Fastener Components, General:

a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant Allen-head slots unless otherwise indicated.

3. Sign Mounting Fasteners:

a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

B. Adhesive: As recommended by sign manufacturer.

1.9 ALUMINUM FINISHES

A. Clear Anodic Finish, Brushed: AAMA 611, Class II, 0.010 mm or thicker, unless otherwise indicated.

1. Exterior Exposure: AAMA 611, Class I, 0.018 mm or thicker.

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.

END OF SECTION 101400

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102219 - DEMOUNTABLE PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes, but is not limited to:

1. Site-assembled demountable partitions.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Site-assembled demountable partitions.

B. Shop Drawings: For demountable partitions.

1. Include plans, elevations, sections, and attachment details at floors, columns, permanent partitions, and ceilings; and method of erection and disassembly.
2. Include diagrams for power-, signal-, and control-wiring raceways; and details of access to raceways.

C. Samples for Verification: For each type of the following products:

1. Linear Trim: 12-inch- (300-mm-) long Samples.
2. Door Finish: Manufacturer's standard-size unit, but not less than 3 inches (75 mm) square.
3. Glazing: Manufacturer's standard-size unit, but not less than 3 inches (75 mm) square.
4. Hardware and Accessories: Whole units.

1.4 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 the installers of the items involved:

1. Suspended-ceiling components and dimensioned ceiling-grid layout.
2. Locations of fixed door and window mullions.
3. Overhead bracing, seismic restraints, and related structural members.
4. Ductwork above ceiling.

B. Qualification Data: For Installer.

C. Product Certificates: For each type of demountable partition.

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D. Product Test Reports: For each type of demountable-partition assembly, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For demountable partitions 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.

1.7 FIELD CONDITIONS

A. Finished Spaces: Do not deliver or install demountable partitions until finishes in spaces to receive them are complete, including suspended ceilings, floors, carpeting, and painting.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide demountable partitions capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Load-Bearing Capacity: Not less than 2.3 lb/linear inch (0.041 kg/linear mm) distributed proof load when tested according to BIFMA X 5.6.
2. Transverse-Load Capacity: Lateral deflection of not more than 1/240 of the overall span when tested under a uniformly distributed load of 5 lb/sq. ft. (24.4 kg/sq. m) according to ASTM E72.

B. Acoustical Performance: Where acoustical rating is indicated, provide demountable-partition assembly tested by a qualified testing agency for sound transmission loss performance according to ASTM E90, calculated according to ASTM E413, and rated for not less than the STC value indicated.

2.2 SITE-ASSEMBLED DEMOUNTABLE PARTITIONS (DP)

A. Site-Assembled Demountable Partitions: Site-assembled, nonprogressive, demountable-partition assembly and components that are the standard products of manufacturer.

B. Manufacturers:

1. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following:

   a. Frameworks Manufacturing.
   b. Raco Interior Products, Inc.
   c. Wilson Partitions.

2. Basis of Design Product: Wilson Partitions, “Series 500” with 1-1/2-inch trim.

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C. System Acoustical Rating: STC 35.

1. System Characteristics: Non-unitized for dismantling into component parts for ease of distribution, installation, and storage.
2. General: Fixed throat jamb extrusions with applied full face trims.
3. Frames: Extruded aluminum, not less than 0.062 inch thick.

    a. Rectilinear design.
    b. 1-1/2 inch face profile.
    c. Snap-On Trim: Manufacturer's standard extrusions.

        1) Width: 1-1/2 inch, unless noted otherwise.

    d. 0.062-inch rabbet wall thickness.
    e. Throat Sizes: Coordinate with partition types.

4. Glass Trim: Extruded aluminum, not less than 0.062 inch thick, designed for glass thickness indicated with removable snap-in casing trim, glazing stops, and door stops without exposed fasteners.
5. Extruded Aluminum Frame Fabrication:

    a. Fabricate door frames, sidelites, and borrowed lites units for assembly with screws utilizing internal screw spline system.
    b. Fabricate to allow assembly in the field without the use of clips or exposed fasteners.
    c. Factory pre-machine door frame jambs and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required, and fastened within frame with concealed screws.
    d. Precut and predrill for screw-spline joinery.
    e. Miter-cut snap-on trim casing in exact cut lengths for top corner joints.

D. Doors:

1. Manufacturer's standard 1-3/4-inch- (45-mm-) thick, aluminum framed glass door construction.

    a. Door Operation: Swinging.
    b. Construction:

        1) Tubular design.
        2) Wide stile (5-1/16").
        3) Top rail (5-1/8").
        4) Bottom rail (9-1/2").

    c. Door Finish: Factory-applied, color anodized aluminum.

        1) Color, Texture, and Pattern: As selected by Architect from manufacturer's full range.

E. Door Frames: Manufacturer's standard aluminum frames for 1-3/4-inch (45-mm) doors, factory mortised to receive hardware.

1. Frame Finish: Color-anodized aluminum.
2. Frame Color: As selected by Architect from manufacturer's full range.

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F. Door Hardware: As indicated on Drawings.

G. Frameless Glazing: Manufacturer's standard laminated clear float glass for butt-glazing with top and bottom support at glazed areas.

H. Seals: Manufacturer's standard.

I. Electrical Devices: Integral, concealed raceways to serve electrical power and communication devices indicated on Drawings.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

J. Accessories: As required for complete installation

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. National Glass Association NGA Publications: "Laminated Glazing Reference Manual" and "GANA Glazing Manual" and "Sealant Manual".
2. Consumer Product Safety Commission (CPSC): Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of CPSC 16 CFR Part 1201 for category II materials.

B. Safety Glazing Labeling: Where safety glazing is indicated or required, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Indicated on label manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

1. Subject to compliance with requirements and local authorities having jurisdiction, provide safety glass with a removable certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.
2. Thickness: Where glass thickness is indicated, it is a minimum and is for detailing only Confirm glass thickness and heat treatment necessary for glass unit sizes required against performance requirements for exterior glazing and in-service conditions. Provide glass that complies with performance requirements and is not less than the thickness indicated.

C. Laminated Glass: ASTM C1172 and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Blemishes that may form or grow over time shall not exceed the limits defined in ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation. Misalignments between laminated panes may not exceed 1/32 inch. At edges, where pvb interlayers may contact silicone sealant, provide 3M glazing tape recommended for separation of silicone and pvb interlayer.

1. Thickness: 10 mm, minimum, at glazed areas.
2. Thickness: 8 mm, minimum, at door glazing.
3. Polyvinyl Butyral Interlayer: Polyvinyl butyral sheets of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.

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a. Laminate panes with polyvinyl butyral interlayer in autoclave with heat plus pressure.
b. Provide clear polyvinyl butyral sheets for laminating clear glass.
c. Acoustic Interlayer:

1) Basis of Design Product: Eastman; “Saflex Acoustic QS71.”

a) Thickness: 0.060 inch (1.52 mm).

2.4 ALUMINUM PRODUCTS

A. Aluminum: Controlled alloy billets meeting requirements of ASTM B221, 6063 T5 alloy, to assure compliance with tight dimensional tolerances and maintain color uniformity.

1. Recycled content of Aluminum Products: Minimum weighted average scrap content of the extrusions to be 47.9 percent. This includes a post-consumer scrap content of 11/1 percent and a pre consumer scrap content of 36.8 percent. The remaining 52.1 percent of the extrusions to be prime aluminum.

2.5 FABRICATION

A. General: Fabricate demountable walls for installation with concealed fastening devices and pressure-fit members that will not damage ceiling or floor coverings. Fabricate systems for installation with continuous seals at floor, ceiling, and other locations where partitions abut fixed construction.

B. Pre-machine jambs and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required, and fastened within the frame.

C. Provide corner reinforcements and alignment clips for precise butt or mitered connections.

D. Fabricate components to allow secure installation without exposed fasteners.

E. Pre-cut and ship frame materials knocked-down for site installation.

F. Wiring: Conceal conductors and cables in raceways. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

2.6 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.

2.7 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker over a mechanical finish.

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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 components before installation. Reject components that are wet, moisture damaged, mold damaged, broken, cracked, chipped, deformed, or unmatched.

C. Examine roughing-in for electrical power to verify actual locations of power connections before partition installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install demountable partitions after other finishing operations have been completed.

1. Install partitions rigid, level, plumb, and aligned. Install seals at connections with floors, ceilings, fixed walls, and abutting surfaces to prevent light and sound transmission.
2. Except for filler panels scribed to fixed walls or columns, do not modify manufacturer's standard components.

B. Doors and Frames: Install door-and-frame and glazing-and-glazing-frame assemblies securely anchored to partitions and with doors aligned and fitted. Install and adjust door hardware for proper operation.

C. Electrical Devices: Connect integral, concealed wiring to serve electrical power and communication devices indicated on Drawings.

1. Connect electrical service at junction-box locations according to applicable Division 26 sections.
2. Connect data communication service at junction-box locations according to applicable Division 27 sections.

3.3 ERECTION TOLERANCES

A. Install each demountable partition so surfaces vary not more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent partitions.

3.4 ADJUSTING

A. Inspect installation, correct misalignments, and tighten loose connections.

B. Doors: Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly, and lubricate as recommended by manufacturer. Verify that latches and locks engage accurately and securely without forcing or binding.

C. Remove and replace defaced or damaged components that cannot be satisfactorily repaired.

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END OF SECTION 102219

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SECTION 102228 - VERTICALLY FOLDING PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Electrically operated, vertically folding acoustical partitions.

C. Related Requirements:

1. Division 05 Section "Metal Fabrications" for supports that attach vertically folding partitions to overhead structural system.
2. Division 09 Section "Gypsum Board Assemblies" for sound barrier construction above the ceiling.

1.2 DEFINITIONS

A. STC: Sound Transmission Class.

1.3 PRE-INSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's specifications, roughing-in diagrams, installation instructions, and electrical rough-in instructions.

B. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:
2. Leadership Extraction Practices:
    a. Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
    b. Bio-Based Materials: Meeting the sustainable Agriculture Network's Sustainable Agriculture Standard and tested per ASTM D6866.
    c. Wood Products: Certified by Forest Stewardship Council or USGBC approved equivalent.
    d. Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.
        1) Include statement indicating costs for each product having recycled content.
3. Sourcing of Raw Materials: For products that are required to comply with requirements for regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

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a. Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.

4. Indoor Environmental Quality, Low Emitting Materials: Building Products must be tested and compliant with the California Department of Public-Health (CDPH) Standard Method V1.1-2010, using the applicable exposure scenario.
5. Paints, and Coatings: For wet applied on site products, include printed statement of VOC content, showing compliance with the applicabl e VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3,-2011.
6. Adhesives and Sealants: For wet applied on site products, submit printed statement showing compliance with the applicable chemical content requirements of SCAQMD Rule 1168, effective July 1, 2005 and rule amendment date of January 7, 2005.
7. Alternative tests for VOC above include ASTM D2369-10; ISO 11890 part 1; ASTM D6886-03; or ISO 11890-2.
8. Methylene Chloride and perchloroethylene may not be added to paints, coating, adhesive or sealants.
9. Composite Wood: Submit documentation showing that wood used in the project has low formaldehyde emissions that meet the California Air Resources Board ATCM for formaldehyde requirements for ultra-low emitting formaldehyde (ULEF) resins or no added formaldehyde resins.

C. Fabrication Engineering and Design: For installed products indicated to comply with performance requirements and design criteria, including comprehensive engineering analysis data signed and sealed by the Florida State licensed professional engineer responsible for their preparation.

D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data for attachments, signed and sealed by the qualified professional engineer responsible for their preparation.
2. Indicate storage and operating clearances. Indicate location and installation requirements for motors, hardware and frame, blocking, and direction of travel.
3. Wiring Diagrams: For power, signal, and control wiring.

E. Setting Drawings: For embedded items and cutouts required in other work, including support-beam, mounting-hole template.

F. 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. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Adjacent items penetrating finished ceiling, including the following:
4. Lighting fixtures.
5. HVAC ductwork, outlets, and inlets.
6. Speakers.
7. Sprinklers.
8. Smoke detectors.
9. Access panels.
10. Microphones.
11. Cameras.

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G. Samples for Verification: For each type of exposed material, finish, covering, or facing indicated, prepared on Samples of size indicated below:

1. Panel: Full width by not less than 2-inch- long section of finished panel to be used for the Work, with specified treatments applied.
2. Textile Facing Material: Full width by not less than 36-inch- (914-mm-) long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat.

1.5 INFORMATION SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Environmental Product Declarations:
   a. Submit product specific type III EPDs or Industry wide (generic) EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle-to-gate scope.
   b. Building Product Disclosure and Optimization - Sourcing of Raw Materials:
2. Raw Material Sources and Extraction Reporting: Submit Raw materials supplier corporate Sustainability Reports (CSRs); documenting responsible extraction; including extraction locations, long term ecologically responsible land use, commitment to reducing environmental harms from extraction and manufacturing processes, and a commitment to meeting applicable standards or programs that address responsible sourcing criteria
   a. Submit manufacturers' self-declared reports
   b. Submit third party verified corporate sustainability reports (CSR) using one of the following frameworks:
      1) Global Reporting Initiative (GRI) Sustainability Report.
      2) Organization for Economic Co-operation and Development (OECD) .Guidelines for Multinational Enterprises.
      3) UN Global Compact.
      4) ISO 26000.
      5) USGBC approved program.
3. Building Product Disclosure and Optimization - Material Ingredients:
4. Material Ingredient Optimization: Submit at least one of the following:
   a. GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
   b. Cradle to Cradle: Manufacturer's published literature for the product bearing the Cradle to Cradle logo, with gold or platinum certification.
   c. International Alternative Compliance Path - REACH Optimization
   d. Declare: Manufacturer's completed Product Declaration Form
   e. Other programs approved by USGBC
5. Product Manufacturer Supply Chain Optimization: Submit documentation from manufacturers for products that go beyond material ingredient optimization as follows:
   a. Are sourced from product manufacturers who engage in validated and robust safety, health, hazard, and risk programs which at a minimum document at least 99% (by weight) of the ingredients used to make the building product or building material, and,

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b. Are sourced from product manufacturers with independent third party verification of their supply chain that at a minimum verifies:

1) Processes are in place to communicate and transparently prioritize chemical ingredients along the supply chain according to available hazard, exposure and use information to identify those that require more detailed evaluation.
2) Processes are in place to identify, document, and communicate information on health, safety and environmental characteristics of chemical ingredients
3) Processes are in place to implement measures to manage the health, safety and environmental hazard and risk of chemical ingredients.
4) Processes are in place to optimize health, safety and environmental impacts when designing and improving chemical ingredients.
5) Processes are in place to communicate, receive and evaluate chemical ingredient safety and stewardship information along the supply chain.
6) Safety and stewardship information about the chemical ingredients is publicly available from all points along the supply chain.

C. Seismic Qualification Certificates: For vertically folding partitions, accessories, and components, from manufacturer.

D. Product Certificates: For each type of vertically folding partition, from manufacturer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each vertically folding partition.

F. Warranty: Sample of special warranty.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of vertically folding partition openings by field measurements before fabrication.

B. Environmental Limitations: Do not deliver or install folding partitions until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.8 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.

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1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of vertically folding partitions that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
2. Faulty operation of vertically folding partitions.
3. Deterioration of metals, metal finishes, and other materials beyond normal wear.
4. Warranty Period: Two years from date of Substantial Completion.

PART 2 - part 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Provide panels with finishes meeting 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: As determined by testing per ASTM E 84.
2. Flame-Spread Index: 25 or less.
3. Smoke-Developed Index: 450 or less.

B. Acoustical Performance: Provide vertically folding partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:

1. Sound-Transmission Requirements: Vertically folding 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.

C. Operation Cycles: Provide vertically folding partition components and operators capable of operating for not less than 10,000 cycles. One operation cycle is complete when a vertically folding partition is opened from the closed position to the fully open position and returned to the closed position.

2.2 VERTICALLY FOLDING PARTITIONS

A. Sole Source Manufacturer: Skyfold, Inc., a dormakaba Group company.

B. Vertically Folding Partitions: Accordion folding frames with pantograph or hinged sections designed for vertical extension and retraction, covered with wood panels with finish facing material, reinforced for hardware attachment, supported by overhead suspension system, and equipped with seals, operators, controls, and accessories.

1. Basis-of-Design Product: Skyfold, Inc., "Zenith Premium 60."

C. Operation: Manufacturer's standard.

1. Stack vertically folding partitions in the up position into a space no greater than 48 inches wide, unless otherwise indicated.
2. Open and close vertically folding partitions so that partition panels fold and unfold at the same time and at the same rate. Sequential folding of partition panels is not acceptable.

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D. Construction: Provide reinforcement as required to support partition from suspension components and provide reinforcement for hardware attachment. Fabricate acoustical panels with joints no more than approximately 1/2-inch wide, and concealed fasteners. Fabricate acoustical panels so finished in-place vertically folding 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. No exposed hinges, brackets, screws, and no part of the mechanical system visible when the vertically folding partition is in the down position.
2. Factory assemble components, assemblies, and systems to the greatest extent possible.

E. Acoustic Panels:

1. Fabricate acoustical panels with a steel face and non-combustible sound insulation so they are rigid when the vertically folding partition is in the down position, and so there is no interference between panels when the vertically folding partition is in motion.
2. Provide acoustical panels that are flat with no bowing, oil canning, warping, waviness, or any other surface deformation or discontinuity.
3. Finish Facings: As indicated on Drawings and specified below.
4. Wallcovering: Provide products in rolls from same production run and complying with the following:

    a. FS CCC-W-408D for Type II, Medium Duty.
    b. Contents: 100 percent Xorel (91 percent biobased PE, 9 percent PE).
    c. Total Weight per Linear Yard: 16 oz, excluding coatings.
    d. Width: 52 inches (1320 mm).
    e. Backing: Manufacturer’s proprietary backing.
    f. Mildew Resistance: Rating of zero or 1 when tested in accordance with ASTM G21.
    g. Colors, Textures, and Patterns: To be determined.

5. Magnetic Whiteboards:

    a. Surface: Porcelain magnetic steel marker/projection surface.
    b. Surface Color: Matching Architect's sample.
    c. Size: As indicated on Drawings.
    d. Trim: Aluminum slip-on or snap-on trim with no visible screws or exposed joints and with corners mitered to a neat, hairline joint.

6. Acoustical Panels: rectangular and nominally the same size, with square corners and edges, with a maximum radius of 1/16-inch.

2.3 SEALS

A. General: Provide types of seals indicated that produce vertically folding partitions complying with acoustical performance requirements and the following:

1. Manufacturer's standard seals.
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 vertically folding partition perimeter and adjacent surfaces, when vertically folding partition is extended and closed.

B. Vertical Side Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on adjacent side walls when extended, ensuring vertical sealing and resisting folding partition movement.

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C. Horizontal Top Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on ceiling when extended, ensuring horizontal sealing and resisting folding partition movement.

D. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal sealing and resisting folding partition movement.

E. Automatically Operated for Vertically Folding Partitions: Extension and retraction of top, side and bottom seal automatically operated by electric motor drive system, with operating range not less than 2 inches between retracted seal and ceiling, side wall and floor finish.

2.4 FINISH PANELS

A. General: Provide finish panels for panels that comply with indicated fire-test-response characteristics and that are factory applied to vertically folding partitions with appropriate backing.

B. Trimless Edges: Fabricate exposed acoustical panel edges so finish wraps uninterrupted around panel, resulting in an installed panel without trim.

2.5 ELECTRIC OPERATORS

A. General: Provide factory-assembled electric operation system of size and capacity recommended and provided by vertically folding partition manufacturer for partition specified; with electric motor and factory-prewired motor controls, remote-control stations, control devices, and accessories required for proper operation.

1. Include wiring from motor control to motor.
2. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
3. Comply with NFPA 70.
4. Provide required hardware and reinforcing to mount motor within space adjacent to partition as indicated on the drawings and verified by manufacturer's qualified engineering professional.

B. Control Equipment: Complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6.

C. Motor Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, within installed environment, with indicated operating sequence, and without exceeding nameplate rating or considering service factor. Comply with NEMA MG 1.

1. Electrical Characteristics:
2. Phase: Three phase.
3. Volts: 208 V.
4. Hertz: 60.
5. Motor Size: Minimum size as indicated, but not less than 1/2 horsepower. If not indicated, large enough to start and operate vertically folding partition in either direction from any position.

D. Remote-Control Stations: Two single-key-operated, constant-pressure control stations located remotely from each other on opposite sides and opposite ends of partition run. Wire in series to require simultaneous activation of both key stations to operate partition. Each three-position control station labeled "Open," "Close," and "Off." Provide two keys per station.

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1. When hand pressure is removed, the partition will immediately stop. The vertically folding partition will stop in a quick and positive fashion without coasting. As a normal part of the operation, it will be possible to partially open or close the wall, stop it, and then reverse the operation.

E. Obstruction-Detection Devices: Provide each motorized vertically folding partition with automatic safety sensor indicated, that causes operator to immediately stop and reverse direction.

F. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop vertically folding partition at fully raised and fully lowered positions.

G. Emergency Release Mechanism: Quick disconnect-release of electric-motor drive system, permitting manual operation in event of operating failure.

H. Electrical:

1. Fabricate the vertically folding partition to be powered by a three phase power supply to the electrical control box.
2. Low Voltage Wiring: Provide low voltage wiring from the switches to the control box.

2.6 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Frame: Steel sheet, manufacturer's standard nominal minimum thickness for uncoated steel.

C. Steel Face/Liner Sheets: Tension-leveled steel sheet, manufacturer's standard nominal minimum thickness for uncoated steel.

D. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; ASTM B 221 for extrusions; manufacturer's standard strengths and thicknesses for type of use.

1. Frame Reinforcement: Manufacturer's standard steel or aluminum.

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 vertically folding partitions.

B. Verify that substrate is level to +/- 1/8 inch over 12 ft., non-cumulative, and that lead edge of partition will engage a smooth flat floor finish. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 INSTALLATION

A. General: Comply with vertically folding partitions manufacturer's written installation instructions.

B. Install vertically folding partitions and accessories after other finishing operations, including painting, have been completed.

C. Install vertically folding partitions as indicated on final approved shop drawings.

D. Broken, cracked, chipped, deformed, or unmatched vertically folding partitions are not acceptable.

E. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps is not acceptable.

3.3 ADJUSTING

A. Adjust vertically folding partitions to operate smoothly, without warping or binding. Lubricate hardware, electric operator, and other moving parts.

3.4 CLEANING

A. Clean soiled surfaces of vertically folding partitions to remove dust, loose fibers, fingerprints, adhesives, and other foreign materials according to manufacturer's written instructions.

3.5 DEMONSTRATION

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

END OF SECTION

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SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Public-use washroom accessories.
2. Private-use bathroom accessories.
3. Childcare accessories.
4. Adjustable height adult changing tables.
5. Underlavatory guards.
6. Adjustable adult care station.
7. Custodial accessories.

C. Related Requirements:

1. Division 08 Section "Mirrors" for frameless mirrors.
2. Division 09 Section "Tiling" for ceramic toilet and bath accessories.

1.2 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Samples for Verification: Full size, for each exposed product and for each finish specified.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.

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2. Identify accessories using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.6 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Refer to drawings for accessories and mounting information.

B. Adjustable-Height Adult Changing Station:

1. Description: Height-adjustable horizontal unit that is electrically operated with wired hand control and with safety rail and receiver tray.

    a. Engineered to support minimum of 400 lb (181 kg) static load when opened.

2. Mounting: Surface mounted, foldable by pneumatic shock-absorbing mechanism.
3. Electrical Characteristics: Manufacturer's standard actuator and control system, with integrated 24 V dc transformer, powered by single 120 V electrical receptacle.
4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin), with PVC mattress.

2.3 UNDERLAVATORY GUARDS

A. Underlavatory Guard:

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

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a. Buckaroos, Inc.
b. Plumberex Specialty Products, Inc.
c. Truebro by IPS Corporation.

2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.4 CUSTODIAL ACCESSORIES

A. Refer to drawings for accessories and mounting information.

2.5 MATERIALS

A. Stainless Steel: ASTM A666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B19, flat products; ASTM B16/B16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.

C. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 (Z180) hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

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B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

END OF SECTION 102800

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SECTION 104116 – EMERGENCY KEY CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Emergency Key Cabinet - Fire Department Key Box.
2. Emergency Gate & Key Switch Cabinet – Fire and Police Department switches.

C. Related Requirements:

1. Division 32 Section “Decorative Metal Fence and Gates” for connection to controls for motorized gate emergency operation.

1.2 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire department key box. Include manufacturer’s specifications and installation instructions for unit built-in or connected to other construction.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Include adjustments to designed wall thicknesses necessary for proper installation.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1. Operation and Maintenance Data: For fire department key box to include in emergency, operation, and maintenance manuals.

1.3 COORDINATION

A. Coordinate installation of anchorages for fire department key box. Furnish directions for installing anchorages, including recessed mounting kits with integral anchors, anchor bolts, and other items, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with local fire department regulations for fire department key box.

B. 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

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A. Deliver fire department key box wrapped and crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Deliver keys to Owner by registered mail or overnight package service.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Key Cabinet Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following.

1. (Basis of Design) Knox-Box 3200 Series with Hinged Door, High Security Commercial Key Box, with 3200 Recessed Mounting Kit (RMK); Knox Company.
2. Acceptable manufacturers include:

a. Allegion; Falcon Key Control System and 9-1-1 box.
b. Kidde; “SupraSafe Rapid Entry System”.

B. Available Gate Switch Cabinet Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following.

1. (Basis of Design) Knox Dual Gate and Key Switch with Hinged Door, 3500 Series, Model #3503, Knox Company.

a. Features:

1) Dual compartments, for Fire Department and Police Department.
2) Mounting plate.
3) Recessed mounting, with screw holes fitting standard electrical 2-gang electrical box.
4) SPDT switches, key removable, two position.
5) Knox Master Key system.
6) Reflective operation decals.

a) Red for Fire Department.
b) Blue for Police Department.

2.2 MATERIALS

A. Steel Plate, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

C. Stainless-Steel Sheet: ASTM A 666, Type 304.

2.3 CABINET DOOR AND BOX ASSEMBLY

A. Door: Fabricated from all-welded, 1/2-inch-thick steel plate construction with interior gasket seal.

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B. Recessed Box Housing: Fabricated from all-welded, 1/4-inch-thick steel plate construction, with jambs, head, and sill, shaped to receive door. Provide fully welded flange on all sides of box housing for a recessed installation. Provide anchorage at rear of box housing for a secure and vandal resistant installation.

C. Size: Door and box assembly shall be approximately 3-1/4 inches deep and large enough to hold 10 keys or access cards in the interior compartment.

D. Finish: Manufacturer's standard factory-applied powder coat finish, applied to door, box housing, and wall flanges.

1. Color: As selected by Architect from manufacturer's full range.

2.4 KEY CABINET HARDWARE AND ACCESSORIES

A. Hinges: Manufacturer’s recommend security hinge fully welded to door and box housing for a secure and vandal resistant installation.

B. Lock: Manufacturer’s recommended UL listed security lock.

1. Provide 1/8-inch-thick stainless steel hinged cover plate with tamper seal for protection of lock case and locking mechanism.

C. Recessed Mounting Kit: Provide manufacturer’s recommended shell housing and mounting hardware for masonry construction. Fire department key box shall fit inside of shell housing. Shell housing shall be fabricated from all welded steel plate construction with reinforcing bars that tie into wall and studs mounted to anchor the fire department key box.

2.5 FABRICATION

A. Fabricate fire department key and gate switch boxes rigid, neat in appearance, and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Weld exposed joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

B. Factory install fire department key box hardware.

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

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and so surfaces are free of oil and other contaminants.

PART 3 - EXECUTION

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3.1 EXAMINATION

A. Examine substrates, areas, and conditions, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate size and location of fire department key box indicated to be recessed into masonry and furnish anchoring devices with diagrams and instructions for their installation.

3.3 INSTALLATION

A. Install recessed shell housing accurately in position and securely anchor into stone-clad masonry wall according to manufacturer's written instructions.

B. Set fire department key box accurately in position; plumbed, aligned, and anchored securely to recessed shell housing; according to manufacturer's written instructions. Embed exposed flanges of box housing in sealant against the exterior masonry wall.

3.4 ADJUSTING AND CLEANING

A. Adjust hardware for proper operation.

B. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION 104116

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SECTION 104313 - DEFIBRILLATOR CABINETS BY OWNER

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Cabinets for automated external defibrillators (AED).

C. Owner-Furnished Material:

1. Automated external defibrillators (AED).
2. Low-voltage signal wiring for AED cabinet alarms.

1.2 PREINSTALLATION CONFERENCE

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to defibrillator cabinets, including, but not limited to, the following:

a. Schedules and coordination requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed- and semirecessed-mounting method and relationships of box and trim to surrounding construction.
2. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for defibrillator cabinets.
3. Include audible alarms and visual alarms.

B. Shop Drawings: For defibrillator cabinets.

1. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For each type of exposed finish required, prepared on samples 6 by 6 inches square.

D. Product Schedule: For defibrillator cabinets. Indicate whether recessed or semirecessed mounted. Coordinate final defibrillator cabinet schedule with Owner provided defibrillator schedule to ensure proper fit and function. Use same designations indicated on Drawings.

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1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For defibrillator cabinets to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate size of defibrillator cabinets to ensure that type and capacity of Owner provided defibrillators indicated are accommodated.

B. Coordinate sizes and locations of defibrillator cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain defibrillator cabinets and accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Defibrillator Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 DEFIBRILLATOR CABINET

A. Cabinet Types: Suitable for automated external defibrillators (AED), as indicated on the Drawings.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following product, or a comparable product by another qualified manufacturer:

    a. Non-Fire-Rated Cabinets: JL Industries, Inc.; a division of the Activar Construction Products Group; 1400 LifeStart Series AED Cabinet.
    b. Fire-Rated Cabinets: JL Industries, Inc.; a division of the Activar Construction Products Group; 1400 Fire-FX2 LifeStart – Fire-Rated AED Cabinet.

A. Cabinet Construction: Nonrated for installation in a nonrated partition. Provide UL-listed or Warnock-Hersey complete with Listing Mark with rating to match rating of partition where it is installed.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch-thick cold-rolled steel sheet lined with minimum 5/8-inch-thick fire-barrier material. Provide factory-drilled mounting holes.

B. Cabinet Material: Cold-rolled steel sheet.

1. Shelf: Same metal and finish as cabinet.

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C. Recessed Cabinet:

1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

E. Cabinet Trim Material: Same material and finish as door.

F. Door Material: Stainless steel sheet.

G. Door Style: Fully glazed 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 projecting door pull and cam-action latch.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

J. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure defibrillator to defibrillator cabinet, of sizes required for types and sizes of defibrillators indicated, with plated or baked-enamel finish.
2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.

a. Identify defibrillator in defibrillator cabinet with the letters "AED," and a custom graphic image.

1) Location: Applied to cabinet glazing.
2) Application Process: Pressure-sensitive vinyl letters.
3) Lettering Color: Red.
4) Custom Graphic Image Color: Red
5) Orientation: Horizontal.

4. Audible Alarm: Manufacturer's standard audible alarm that actuates when defibrillator cabinet door is opened and that is powered by batteries.
5. Visual Alarm: Manufacturer’s standard green strobe light visual alarm that actuates when defibrillator cabinet door is opened and that is powered by batteries.
6. Alarm Signal Wiring Terminals: Provide concealed electrical connection terminals in AED cabinet for connection to Owner’s low voltage signal wiring.

K. Materials:

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1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.

    a. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
    b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    c. Color: As selected by Architect from manufacturer's full range.

2. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304.

    a. Finish: ASTM A480/A480M No. 4 directional satin finish.

3. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.4 FABRICATION

A. Defibrillator 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. 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.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Miter and weld perimeter door frames and grind smooth.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of defibrillator cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish defibrillator cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed and semirecessed defibrillator cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install defibrillator cabinets in locations and at mounting heights indicated or, if not indicated, at height indicated below:

1. Defibrillator Cabinets: 42 inches above finished floor to top of defibrillator.

B. Defibrillator Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed defibrillator cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed defibrillator cabinets.
2. Fasten mounting brackets to inside surface of defibrillator cabinets, square and plumb.
3. Fire-Rated Defibrillator Cabinets:

    a. Seal through penetrations with firestopping sealant as specified in Section 078413 "Penetration Firestopping."

C. Identification:

1. Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as defibrillator cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust defibrillator cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of defibrillator cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace defibrillator cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by defibrillator cabinet and mounting bracket manufacturers.

E. Replace defibrillator cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

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END OF SECTION 104313

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SECTION 104400 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Board of Regents of the University System of Georgia, Office of Real Estate and Facilities, Building Project Procedures Manual.

1.2 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section Includes:

1. Portable fire extinguishers.
2. Fire-protection cabinets for the following:
    a. Portable fire extinguishers.
    b. Portable fire extinguisher, fire hose, and fire hose valve.
3. Mounting brackets for fire extinguishers.

C. Related Requirements:

1. Accessories and anchorage/blocking for attachment of cabinets and brackets.
2. Division 21 Section "Water-Based Fire-Suppression Systems" for fire-hose connections.

1.3 ACTION SUBMITTALS

A. Submit in accordance with provisions stated in Division 01 Section “Submittal Procedures.”

B. 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.

C. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

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.

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F. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated can be accommodated.

B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated can be accommodated.

C. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.6 SEQUENCING

A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

1.7 QUALITY ASSURANCE

A. General: All portable fire extinguishers and non-valved cabinets shall be furnished and installed by the General Contractor. All portable fire extinguishers and components shall conform to National Fire Protection Association (NFPA) Pamphlet 10, latest edition. Each extinguisher shall be approved by Underwriter’s Laboratory (UL) and bear their label.

B. Approvals: The selection and locations of the fire extinguishers are subject to the review and approval of the University Project Manager and designated University personnel from the Division of Environmental Health and Safety. Extinguishers meeting the described requirements, including those manufactured by Amerex or Buckeye will be considered for acceptance.

C. Selection and Quantity: Refer to NFPA Pamphlet 10, Chapters 2, 3, and 4. Chapter 2 is used to determine the classification of potential fires and the rating or relative fire extinguishing effectiveness of various types of extinguishers. Chapter 3 assists in selection of extinguishers which is dependent upon the character of anticipated fires, property construction and occupancy, the vehicle or hazard to be protected, ambient temperature conditions, and other factors. The quantity of extinguisher is determined by Chapter 4.

D. Caution: Penetration of walls by cabinets or other penetrations, unless openings and voids are sealed with fireproof materials, is prohibited. Fire-rated walls must not have the rating reduced by penetrations or reduction of thickness.

E. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.

F. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

G. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

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H. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E814 for fire-resistance rating of walls where they are installed.

PART 2 - PRODUCTS

2.1 PORTABLE FIRE EXTINGUISHERS

A. General: Provide visual identification signage per Georgia Codes.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amerex Corporation.
2. Buckeye.
3. Potter Roemer; Div. of Smith Industries, Inc.

C. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Valves: Manufacturer's standard.
2. Handles and Levers: Manufacturer's standard.
3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

D. Multipurpose Dry-Chemical Type: UL-rated 4-A:80-B:C, 10-lb nominal capacity, in enameled-steel container.

E. Class “K” – Food and Catering Kitchens: UL Rated 2A:K, 2.5 gallon capacity.

F. Clean Agent Type (HFC) – Electronic Data Closets: UL Rated 2A:10B:C

G. Clean Guard MR – Conditionals Extinguishers Type for MRI areas 1A:10B:C

2.2 FIRE PROTECTION SPECIALTIES

A. General: Provide visual identification signage per applicable Stare of Georgia requirements and GSU regulations.

B. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following.

1. JL Industries, Inc.
2. Larsen’s Manufacturing Company.
3. Potter Roemer; Division of Smith Industries, Inc.

2.3 FIRE-PROTECTION CABINETS

A. Fully Recessed:

1. Basis-of-Design Product:

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a. Larsen's Manufacturing Company; Model 2409-R2.

2. Cabinet Construction: Manufacturer's standard enameled steel box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style shown suitable for Owner furnished fire extinguisher. Weld all joints and grind smooth. Miter and weld perimeter door frames.
3. Construct cabinets with double walls fabricated from 0.0428-inch thick, cold-rolled steel sheet. At fire rated cabinets, line double walls with minimum 5/8-inch thick, fire-barrier material. Provide factory-drilled mounting holes.
4. Fire Rated Cabinets: UL listed with UL listing mark with fire resistance rating of wall where it is installed, with minimum 1-hour fire rated if walls are not otherwise identified.
5. Cabinet Type: Suitable for mounting conditions shown, of the following types:
6. Recessed: Cabinet box (tub) fully recessed in walls of sufficient depth to suit style of trim shown.
7. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Fabricate trim in one piece with corners mitered, welded, and ground smooth.
8. Door Material and Construction: Manufacturer's standard steel door construction, coordinated with cabinet types and trim styles selected.
9. Door Style: Manufacturer's standard solid steel panel design with frame.
10. Door Hardware: Provide manufacturer's standard door operating hardware of proper type for cabinet type, trim style, and door material and style shown. Provide concealed or continuous type hinge permitting door to open 180 deg.

B. Semi-Recessed Fire Extinguisher Cabinets (Painted):

1. Mounting: Semi-Recessed.
2. Door Style: Full Glazed Panel (clear acrylic).
3. Door Material: Aluminum sheet, painted white.
4. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

    a. Provide projecting lever handle with cam-action latch.
    b. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

5. Finishes:

    a. Interior of cabinet: manufacturer's standard baked-enamel paint.

6. Accessories:

    a. Mounting Brackets: 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.

2.4 FIRE HOSE AND FIRE DEPARTMENT VALVE CABINETS

A. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include the following.

1. Ansul Fire Protection.
2. J.L. Industries.

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3. Potter-Roemer, Inc.

B. Basis of Design Product: Potter Roemer; “Fire Pro 1810 Series.”

1. Fully recessed.
2. Manufacturer's standard 22 gage enameled steel flat-trim box.
3. Valve: 4’-6” AFF.
4. Cabinet Trim Material: Steel sheet.
5. Door Material: Painted steel sheet at offices; #304 stainless steel at laboratories.
6. Door Style: Full Glass.
7. Door Glazing: Tempered break glass.

C. Cabinet Construction: Fire-rated.

2.5 MOUNTING BRACKETS

A. Manufacturers:

1. Larsen's Manufacturing Company.
2. Amerex Corporation.
3. JL Industries, Inc.
4. Potter Roemer; Div. of Smith Industries, Inc.

B. 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 baked-enamel finish.

1. Color: Black.

C. 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.
2. Orientation: Vertical.

2.6 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. 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.

a. Provide factory-drilled mounting holes.

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 with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Miter and weld perimeter door frames.

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C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.7 FINISHES, GENERAL

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 unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 STEEL FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

B. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.

1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.

B. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

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B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

D. Identification: Apply vinyl lettering 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 104400

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SECTION 105123 - PLASTIC-LAMINATE-CLAD LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Plastic-laminate-clad wood lockers.
2. Locker benches.

1.2 ACTION SUBMITTALS

A. Product Data: For each product include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker

1. Plastic-laminate-clad wood lockers.
2. Locker benches.

B. Sustainable Design Submittals:

1. For certified wood products.

C. Shop Drawings: For plastic-laminate-clad wood lockers.

1. Include plans, elevations, sections, and attachment details.
2. Show details full size.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in lockers.
5. Show locker fillers, trim, base, sloping tops, and accessories.
6. Show locker identification system and numbering sequence.

D. Samples for Initial Selection: For each type of the following:

1. High-pressure decorative laminates.
2. Thermally fused laminate overlay panels.

E. Samples for Verification: For the following products:

1. Plastic-laminate-clad panels, not less than 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish.
2. Thermally fused laminate-overlay-surfaced panels, not less than 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish.
3. Corner pieces of locker front frame joints between stiles and rail, as well as exposed end pieces, not less than 18 inches wide by 18 inches high by 6 inches deep (457 mm wide by 450 mm high by 152 mm deep).
4. Exposed cabinet hardware and accessories, one unit for each type and finish.
5. Carpet, not less than 8 by 10 inches (200 by 250 mm), for each type, color, and pattern.

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1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Locker doors, complete with specified door hardware. Furnish no fewer than five doors of each type and color installed.
2. Units of the following locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:

    a. Hinges.
    b. Pulls.
    c. Shelf rests.
    d. Cylinder locks.
    e. Blank identification plates.
    f. Hooks.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver lockers until painting and similar operations that could damage lockers have been completed in installation areas. If lockers must be stored in other-than-installation areas, store only in areas where environmental conditions are the same as those in final installation location, and comply with requirements specified in "Field Conditions" Article.

B. Deliver combination control charts to Owner by registered mail or overnight package service.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install lockers until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70 percent during the remainder of the construction period.

B. Field Measurements: Where lockers are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.

1. Locate concealed framing, blocking, and reinforcements that support lockers by field measurements before being enclosed, and indicate measurements on Shop Drawings.

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C. Established Dimensions: Where lockers are indicated to fit to other construction, establish dimensions for areas where lockers are to fit. 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 concealed wood support bases.

1. Requirements are specified in Section 061000 "Miscellaneous Rough Carpentry."

B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that lockers can be supported and installed as indicated.

C. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 087100 "Door Hardware" to fabricator of lockers; coordinate Shop Drawings and fabrication with hardware requirements.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of lockers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of locks or hardware.
c. Deterioration of wood, finishes, and other materials beyond normal use.

2. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: For lockers and locker benches indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 PLASTIC-LAMINATE-CLAD WOOD LOCKERS

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

1. Hollman, Inc.
2. Ideal Products, Inc.
3. List Industries Inc.
4. Treeforms.

B. Construction Style: Flush overlay.

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C. Final Assembly: Manufacturer's standard factory assembly.

D. Locker Body: Fabricated from fire-retardant-particleboard-core panels covered on both sides with thermally fused laminate overlay.

E. Plastic-Laminate-Clad Wood Doors: High-pressure decorative laminate, Grade VGS, over both sides of fire-retardant-particleboard core.

F. End Panels: Match style, material, construction, and finish of plastic-laminate-clad wood doors.

G. Shelves: Fabricated from fire-retardant-particleboard-core panels covered on both sides with thermally fused laminate overlay; fixed unless otherwise indicated.

H. Corners and Filler Panels: 3/4-inch- (19-mm-) thick panels. Match style, material, construction, and finish of plastic-laminate-clad wood doors.

I. Continuous Finish Base: Plastic-laminate-clad, 3/4-inch- (19-mm-) thick panel that matches door faces; fabricated in lengths as long as practical to enclose base and base ends of lockers.

J. Continuously Sloping Tops: Plastic-laminate-clad, 3/4-inch- (19-mm-) thick panel that matches door faces for installation over lockers with separate flat tops. Fabricate tops in lengths as long as practical, without visible fasteners at splice locations. Provide fasteners, supports, and closures, as follows:

1. Closures: Hipped-end type.
2. Sloping-top corner fillers, mitered.

K. Plastic-Laminate Colors, Patterns, and Finishes:

1. Match Architect's samples.

2.3 MATERIALS

A. Composite Wood: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.

B. High-Pressure Decorative Laminate: ISO 4586-3, grades as follows:

1. Horizontal Surfaces: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade HGS.

C. Fire-Retardant-Treated Materials: Where fire-retardant-treated materials are indicated, use materials impregnated with fire-retardant chemical formulations indicated by a pressure process or other means acceptable to authorities having jurisdiction to produce products with fire-test-response characteristics specified.

1. Do not use material that is 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 in solution to distinguish treated material from untreated material.

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3. Fire-Retardant Particleboard: Panels 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 according to ASTM E84:

   a. Panels 3/4 Inch (19 mm) Thick and Less: ANSI A208.1, Grade M-2, except for the following minimum properties: density, 45 lb/cu. ft. (720 kg/cu. m); modulus of rupture, 1600 psi (11 MPa); modulus of elasticity, 300,000 psi (2000 MPa); internal bond, 80 psi (550 kPa); and screw-holding capacity on face and edge, 250 and 225 lbf (1100 and 1000 N), respectively.
   b. Panels 13/16 to 1-1/4 Inches (20 to 32 mm) Thick: ANSI A208.1, Grade M-1, except for the following minimum properties: density, 44 lb/cu. ft. (705 kg/cu. m); modulus of rupture, 1300 psi (9 MPa); modulus of elasticity, 250,000 psi (1700 MPa); linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf (1100 and 780 N), respectively.

D. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

E. Anchors: Material, type, size, and finish as required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

F. Wood Support Base: 2-by-4-inch nominal-size (51-by-102-mm, actual-size) lumber treated with manufacturer's standard preservative-treatment, pressure process.

2.4 HARDWARE

A. Cam Padlock Hasp: Surface mounted, steel; finished to match other locker hardware.

B. Frameless Hinges (European Type): Fully concealed, self-closing, nickel-plated steel, with not less than 125 degrees of opening.

1. Provide two hinges for doors 36 inches (910 mm) high and less.
2. Provide three hinges for doors more than 36 inches (910 mm) high.

C. Wire Pulls: Back mounted; 5 inches (127 mm) long, 2-1/2 inches (62 mm) deep, and 5/16 inch (8 mm) in diameter.

D. Accessible Handle: Metal, fixed, graspable lever handle and rose trim; surface mounted.

E. Shelf Rests: BHMA A156.9, B04013.

F. Hooks: Manufacturer's standard, ball-pointed aluminum or steel; finished to match other locker hardware. Attach hooks with at least two fasteners.

1. Provide one double-prong ceiling hook and two single-prong wall hooks for each locker compartment.

G. Exposed Hardware Finish:

1. Polished chrome, unless otherwise indicated.

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2.5 ACCESSORIES

A. Number Identification Plates: 1-1/2-inch- (38-mm-) diameter, etched, embossed, or stamped, stainless steel plates with black numbers and letters at least 1/2 inch (13 mm) high. Identify lockers in sequence indicated on Drawings.

2.6 LOCKER BENCHES

A. Pedestal-Leg Locker Benches: Bench top supported by pedestal legs, minimum of two pedestals for each bench, with overall height of 18 inches (457 mm) measured from top of bench to floor, as follows:

1. Metal Pedestal Legs: 1-1/2-inch- (38-mm-) diameter, stainless steel round tube or pipe.
2. Bench Tops: 1-1/4 inches (32 mm) deep; fabricated as follows:

    a. Butcher Block Top: Solid laminated hardwood.
    b. Width: 15 inches (381 mm) except provide minimum 20-inch (508-mm) width where accessible benches are indicated.
    c. Length: As indicated on Drawings.

2.7 FABRICATION

A. Fabricate each locker with shelves, an individual door and frame, an individual top, a bottom, and a back, and with common intermediate uprights separating compartments.

1. Fabricate lockers to dimensions, profiles, and details indicated.
2. Ease edges of corners of solid-wood members to 1/16-inch (1.5-mm) radius.

B. Fabricate lockers square, rigid, without warp, and with finished faces flat and free of dents, scratches, and chips. Accurately factory machine components for attachments. Make joints tight and true.

1. Fabricate lockers using manufacturer's standard construction, with joints made with dowels, dados, or rabbets. Dado side panels to receive shelving except where indicated to be adjustable.
2. Fabricate lockers with joints that are dadoed or rabbeted, glued full length, and stapled. Dado side panels to receive shelving except where indicated to be adjustable.

C. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.

D. Venting: Fabricate lockers with space between doors and locker assembly of not less than 1/4 inch (6 mm).

E. Number Identification Plates: Inlay number plates flush in each locker door, near top, centered.

F. 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.

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1. 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 the parts fit as intended, and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
2. Use only manufacturer's nuts, bolts, screws, and other devices for assembly.

G. Shop cut openings, to maximum extent possible, to receive hardware, 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.

H. Attach PVC edging to panels by thermally fusing edging to panels after panel fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and floors or support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify that furring is attached to concrete and masonry walls that are to receive lockers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Condition lockers to average prevailing humidity conditions in installation areas before installation.

B. Before installing lockers, examine factory-fabricated work for completeness and complete work as required, including removal of packing.

3.3 INSTALLATION

A. Install wood support base with 1/2-inch- (13-mm-) thick, plywood top.

B. Knocked-Down Lockers: Assemble with manufacturer's standard fasteners, with no exposed fasteners on face frames.

C. Install lockers level, plumb, and true; use concealed shims.

D. Connect groups of lockers together with manufacturer's standard fasteners, through predrilled holes, with no exposed fasteners on face frames. Fit lockers accurately together to form flush, tight, hairline joints.

E. Install lockers without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings, providing unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Installation Tolerance: No more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line. Shim as required with concealed shims.

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F. Locker Anchorage: As recommended by manufacturer for conditions encountered.

1. Fasten lockers through wood locker base, at ends, and not more than 36 inches (910 mm) o.c. with wood screws sized for 1-inch (25-mm) penetration into wood base.
2. Fasten lockers through back, near top and bottom, at ends with fasteners spaced not more than 16 inches (400 mm) o.c.

G. Scribe and cut corner and filler panels to fit adjoining work using fasteners concealed where practical. Repair damaged finish at cuts.

H. Attach sloping-top units to lockers, with end panels covering exposed ends.

I. Install number identification plates after lockers are in place.

1. Attach number identification plate on each locker door, near top, centered, with at least two screws with finish matching the plate.

J. Provide protective mat at each shoe shelf.

K. Fixed Locker Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than 72 inches (1830 mm) apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

3.4 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors to operate easily without binding. Verify that integral locking devices operate properly.

3.5 PROTECTION

A. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105123

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SECTION 105623 - WIRE STORAGE SHELVING

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 shelving :

1. Wire-Type, Four-Post Metal Storage Shelving.

B. Related Sections:

1. Division 01 "Sustainable Design Requirements" for additional LEED requirements.
2. Division 12 “Laboratory Casework.” If alternates or allowances apply to Work of this Section, insert brief paragraphs here to alert Contractor and reference appropriate Division 1 Section for specific details.

1.3 ACTION SUBMITTALS

A. Product Data: Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.

B. Shop Drawings: Show fabrication and installation details for metal storage shelving, including upright-to-shelf/arm connections, lateral bracing, and attachments to other work. Include plans, elevations, sections, details, and relationship to other work.

C. Samples for Verification: For the shelving components, manufacturer’s standard sizes.

D. Sustainable Design Submittals:

1. Product Data: For recycled content of product, separately identifying the percentage of pre-consumer (post-industrial) recycled content and percentage of post-consumer recycled content.
2. Extended Producer Responsibility Verification: Indicating manufacturer participates in or operates a take-back or recycling program for the product purchased.
3. Product Certificates: For materials manufactured within 100 miles of Project, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each raw material.

1.4 INFORMATIONAL SUBMITTALS

A. Sustainable Design Submittals:

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1. Environmental Product Declaration: For each product.
2. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
3. Product Ingredient Disclosure: For materials, confirming chemical inventory of products to at least 0.1% (1000 ppm).
4. Product Ingredient Optimization: For materials, confirming chemical inventory via an approved optimization program.

B. Qualification Data: For Installer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of metal storage shelving.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal storage shelving to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Manufacturer Qualifications: Manufacturer experienced in successfully producing metal shelving units similar to that indicated for this Project with sufficient production capacity to produce required units without causing delay in the Work.

C. Source Limitations: Obtain metal storage shelving through one source from a single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver metal storage shelving palleted, wrapped, or crated to provide protection during transit and Project-site storage.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install metal storage shelving until spaces are enclosed and weatherproof, wet work in spaces is completed and dry, and ambient temperature is being maintained at the levels indicated for Project when occupied for its intended use.

1.9 COORDINATION

A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to partition and wall assemblies.

B. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving mounted on mobile storage unit carriage platforms.

C. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, and sprinklers.

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PART 2 - PRODUCTS

2.1 WIRE-TYPE METAL STORAGE SHELVING

A. Wire-Type, Four-Post Metal Storage Shelving: Factory-formed, field-assembled, freestanding system without back or end panels, designed for shelves to span between and be supported by corner posts, with shelves adjustable over the entire height of shelving unit. Fabricate initial shelving unit with a post at each corner. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories indicated.

B. Available Manufacturers providing products in compliance with requirements include the following or equal:

1. Global Industrial Commercial Wire Shelving
2. (Basis of Design) Metro, Emerson Storage Solutions
3. Omega Products Corporation.

C. Basis of Design Product: MetroMax Shelving System or approved equal.

1. (Basis of Design) Metro Shelves Type 304 Stainless Steel Shelving. Dimensions: as indicated.
2. Framed-Type Wire Shelves: Stainless-steel wire-over-wire construction with shelf frame fabricated from same material and with same finish as posts; with manufacturer's standard post collar, designed to engage collet (wedge), welded at each corner.

2.2 FABRICATION

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.

2.3 MATERIALS

A. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

2.4 FASTENERS

A. Postinstalled Expansion Anchors in Concrete: With capability to sustain, without failure, a load equal to 4 times the load imposed, 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 (0.005 mm) for Class SC 1 service condition (mild).

B. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A, with hex nuts, ASTM A 563, and, where indicated, flat washers.

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C. Plain Washers: Round, carbon steel, FS FF-W-92.

D. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish all steel surfaces, components, and accessories except prefinished stainless-steel and chrome-plated surfaces.

2.6 STEEL FINISHES

A. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 0.025 mm for topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 0.05 mm.

1. Color and Gloss: As selected by Design Professional from manufacturer's full range.

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 work.

B. Examine floors for suitable conditions where metal storage shelving will be installed.

C. Examine walls to which metal storage shelving will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install metal storage shelving level, plumb, square, rigid, and true, and within erection tolerances according to manufacturer’s written directions..

B. Erection Tolerances: Erect metal storage shelving with a maximum tolerance from vertical of 1/2 inch from 0 to 10 feet of height and remaining constant at a maximum of 1 inch for all heights taller than 10 feet.

3.3 ADJUSTING AND CLEANING

A. Verify that shelves and shelf-to-post connectors adjust easily and properly.

B. On completion of installation, clean exposed surfaces as recommended by manufacturer.

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C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.

D. Replace metal storage shelving that has been damaged or has deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 105663

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SECTION 107516 - GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes, but is not limited to:

1. Ground-set flagpoles made from aluminum.

B. Owner-Furnished Material: Flags.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

B. Shop Drawings: For flagpoles.

1. Include plans, elevations, and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
2. Include section, and details of foundation system.

C. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

D. Fabrication Engineering and Design Submittal: For flagpoles.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fabrication Engineering and Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design flagpole assemblies.

B. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated.

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1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is indicated on Drawings.
2. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.2 MANUFACTURERS

A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.3 ALUMINUM FLAGPOLES

A. Aluminum Flagpoles: Cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.

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

a. Acme/Lingo Flagpoles, LLC.
b. American Flagpole.
c. Concord Industries, Inc.

B. Exposed Height: One flagpole 35 feet high, unless otherwise indicated.

C. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, 0.060-inch wall thickness with 3/16-inch steel bottom plate and support plate; 3/4-inch-diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.

1. Flashing Collar: Same material and finish as flagpole.

2.4 FITTINGS

A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. 0.063-inch spun aluminum, finished to match flagpole.

B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

1. Halyard Flag Snaps: Stainless-steel swivel snap hooks. Furnish two per halyard.

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2.5 MISCELLANEOUS MATERIALS

A. Concrete: Comply with requirements in Section 033000 "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.

B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

C. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.

D. Sand: ASTM C33/C33M, fine aggregate.

E. Elastomeric Joint Sealant: Single-component neutral-curing silicone joint sealant complying with requirements in Section 079200 "Joint Sealants."

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.

D. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.

E. Place concrete, as specified in Section 033000 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use nonstaining curing compound.

F. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer's written instructions.

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B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION 107516

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SECTION 111300 - LOADING DOCK EQUIPMENT

Not Required

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Recessed loading dock levelers.
2. Dock bumpers.

C. Related Requirements:

1. Division 03 Section "Cast-in-Place Concrete" for concrete work for recessed loading dock equipment.
2. Division 05 "Metal Fabrications" for metal connections.
3. Division 26 Sections for electrical wiring and connections for loading dock equipment.
4. Division 33 sections for drainage piping for loading dock recessed pit.

1.2 DEFINITIONS

A. Operating Range: Maximum amount of travel above and below the loading dock level.

B. Working Range: Recommended amount of travel above and below the loading dock level for which loading and unloading operations can take place.

1.3 COORDINATION

A. Coordinate size and location of loading dock equipment indicated to be attached to or recessed into concrete or masonry, and furnish anchoring devices with templates, diagrams, and instructions for their installation to ensure proper clearances and operation of equipment.

1. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

B. Coordinate installation of anchorages for loading dock equipment. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Electrical System Roughing-in: Coordinate layout and installation of loading dock equipment with connections to power supplies and interlocked equipment. Refer to Division 26 Sections.

1.4 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at the Project Site.

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1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
2. Review sequence of operation for each type of loading dock equipment.
3. Review coordination of interlocked equipment specified in this Section and elsewhere.
4. Review required testing, inspecting, and certifying procedures.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for stationary loading dock equipment.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, details, pit dimensions, and attachments to other work.

1. Show fabrication and installation details. Include plans, elevations, sections, details, pit dimensions, and attachments to other work.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of anchors and each field connection.
3. Wiring Diagrams: Include diagrams for power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Welding Certificates.

C. Product Test Reports: Based on evaluation of tests performed by manufacturer and supervised and verified by a qualified independent professional engineer, indicate compliance of dock levelers with requirements of MH 30.1 for determining rated capacity, which is based on comprehensive testing within the last two years of current products.

1. Submittal Form: According to MH 30.1, Appendix A.

D. Warranties: Special warranties specified in this Section.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For stationary loading dock equipment to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

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B. Source Limitations: Obtain each type of loading dock equipment through one source from a single manufacturer.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

D. Preinstallation Conference: Conduct conference at Project site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver loading dock equipment to project site in manufacturer's fully identified containers.

B. Store in accordance with manufacturer instructions above grade on dunnage, properly protected from weather and construction activities.

1.10 FIELD CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

1. Field Measurements: Verify actual dimensions of construction contiguous with stationary loading dock equipment, including recessed pit dimensions, slopes of driveways, and heights of loading docks or walls, by field measurements before fabrication.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish recessed pit dimensions and proceed with fabricating loading dock equipment without field measurements. Coordinate loading dock construction to ensure that actual dimensions correspond to established dimensions.

1.11 WARRANTY

A. Special Warranty for Dock Levelers: Manufacturer's standard form in which manufacturer agrees to repair or replace dock leveler components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including cracked or broken structural support members and load-bearing welds.
b. Deck plate failures including cracked plate or permanent deformation in excess of 1/4-inch between deck supports.
c. Hydraulic system failures including failure of hydraulic seals and cylinders.
d. Faulty operation of operators, control system, or hardware.

2. Warranty Period for Structural Assembly: 10 years from date of Substantial Completion.
3. Warranty Period for Hydraulic System: Five years from date of Substantial Completion.
4. Warranty shall be for unlimited usage of leveler for the specified rated capacity over the term of the warranty

B. Special Warranty for Truck Restraints: Manufacturer's standard form in which manufacturer agrees to repair or replace truck restraint components that fail in materials or workmanship within specified warranty period.

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

PART 2 - **PRODUCTS**

2.1 MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following:

1. McGuire, a division of Systems, LLC.
2. Pentalift Equipment Corporation.
3. Rite-Hite.

2.2 RECESSED LOADING DOCK LEVELERS

A. General: Recessed, hinged-lip-type dock levelers designed for permanent installation in concrete pits preformed in the edge of loading platform; of type, function, operation, capacity, size, and construction indicated; and complete with controls, safety devices, and accessories required.

B. Basis of Design Product: Rite-Hite “RHH-4000” Hydraulic Dock Leveler.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Standard: Comply with MH 30.1.

E. Rated Capacity: Capable of supporting total gross load of 20,000 (9072) lb (kg) without permanent deflection or distortion.

F. Platform: Not less than 1/4- (6-) inch- (mm-) thick, nonskid steel plate.

1. Platform Width: As indicated on Drawings.
2. Platform Length: As indicated on Drawings.
3. Frame: Manufacturer's standard.
4. Toe Guards: Equip open sides of dock leveler over range indicated with steel toe guards.

    a. Toe-Guard Range: Entire upper working range.

G. Hinged Lip: Not less than 1/2- (13-) inch- (mm-) thick, nonskid steel plate.

1. Hinge: Full-width, piano-type hinge with heavy-wall hinge tube and grease fittings, with gussets on lip and ramp for support.
2. Safety Barrier Lip: Designed to protect material-handling equipment from an accidental fall from loading platform edge of the dock leveler when the leveler is not in use.

H. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.

1. Vertical Travel: Operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact with the following minimum working range:

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a. Above Adjoining Platform: 12 inches (305 mm).
b. Below Adjoining Platform: 12 inches (305 mm).

2. Automatic Vertical Compensation: Floating travel of ramp with lip extended and resting on truck bed shall compensate automatically for upward or downward movement of truck bed during loading and unloading.
3. Automatic Lateral Compensation: Tilting of ramp with lip extended and resting on truck bed shall compensate automatically for canted truck beds of up to 4 inches (102 mm) over width of ramp.
4. Lip Operation: Manufacturer's standard mechanism, which automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler's working range, allows lip to yield under impact of incoming truck and automatically retracts lip when truck departs.

    a. Length of Lip Extension: Not less than 12 inches (305 mm) from face of dock bumpers and not less than) 18 inches (457 mm) measured from ramp edge.

5. Automatic Ramp Return: Automatic return of unloaded ramp, from raised or lowered positions to stored position, level with platform, as truck departs.
6. Interlock: Leveler does not operate while overhead door is in closed position.

I. Hydraulic Operating System: Electric control from a remote-control station; fully hydraulic operation. Electric-powered hydraulic raising and hydraulic lowering of ramp. Equip leveler with a packaged unit including a unitized, totally enclosed, nonventilated electric motor, pump, manifold reservoir, and valve assembly of proper size, type, and operation for capacity of leveler indicated. Include means for lowering ramp below platform level with lip retracted behind dock bumpers. Provide a hydraulic velocity fuse connected to main hydraulic cylinder to limit loaded ramp's free fall to not more than 3 inches (76 mm).

1. Remote-Control Station with Emergency Stop: Weatherproof multibutton control station with an UP button of the constant-pressure type and an emergency STOP button of the momentary-contact type, enclosed in NEMA ICS 6, Type 4 box. Ramp raises by depressing and holding UP button; ramp lowers at a controlled rate by releasing UP button. Ramp movement stops, regardless of position of ramp or lip, by depressing STOP button. Normal operation resumes by engaging a manual reset button or by pulling out STOP button.

    a. Dual-Panel Control Station: Remote-control station for operating side-by-side dock levelers.
    b. Master Panel: Control panel with integral fused disconnecting means for operating dock leveler, dock door, and truck restraints.

2. Independent Lip Operation: Electric-powered hydraulic raising and hydraulic lowering of lip, controlled independent of raising and lowering of ramp.

J. Construction: Fabricate dock-leveler frame, platform supports, and lip supports from structural- or formed-steel shapes. Weld platform and hinged lip to supports. Fabricate entire assembly to withstand deformation during both operating and stored phases of service. Chamfer lip edge to minimize obstructing wheels of material-handling vehicles.

1. Cross-Traffic Support: Manufacturer's standard method of supporting ramp at platform level in stored position with lip retracted. Provide a means to release supports to allow ramp to descend below platform level.

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1. Thickness: 4-1/2-inches.
2. Vertical Style: 11-inches wide by 24-inches high.

D. Anchorage Devices: Hot-dip galvanized steel anchor bolts, nuts, washers, bolts, sleeves, cast-in-place plates, and other anchorage devices as required to fasten bumpers securely in place and to suit installation type indicated.

2.4 SAFETY DEVICES

A. Provide the following manufacturer's standard safety devices:

1. Mid-level safety chain with hooks across each end.
2. 8" Electric toe guards on every side.
3. Rear mechanical roll-off stops.
4. Warning bell.
5. Amber flashing light.
6. Shutoff valve.
7. Dock height limit switch.
8. Quick-disconnect with pendant controls.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish loading dock equipment after assembly and testing.

C. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A123/A123M for iron and steel loading dock equipment.
2. ASTM A153/A153M for iron and steel hardware for loading dock equipment.

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 loading dock equipment.

B. Examine roughing-in for electrical systems for loading dock equipment to verify actual locations of connections before equipment installation.

C. Examine walls and floors of pits for suitable conditions where recessed loading dock equipment is to be installed. Pits shall be plumb and square and properly sloped for drainage from back to front of loading dock.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

A. Coordinate size and location of loading dock equipment indicated to be attached to or recessed into concrete or masonry, and furnish anchoring devices with templates, diagrams, and instructions for their installation.

B. Set curb angles in concrete edges of dock leveler recessed pits with tops flush with adjacent grade. Fit exposed connections together to form hairline joints.

C. Clean recessed pits of debris.

3.3 INSTALLATION

A. General: Install loading dock equipment, including motors, pumps, control stations, wiring, safety devices, and accessories as required for a complete installation.

1. Rough-in electrical connections according to requirements specified in Division 26.

B. Dock Bumpers: Attach dock bumpers to face of loading dock in a manner that complies with requirements indicated for spacing, arrangement, and position relative to top of platform and anchorage.

1. Bolted Attachment: Attach dock bumpers to preset anchor bolts embedded in concrete or to cast-in-place inserts or threaded studs welded to embedded-steel plates or angles. If preset anchor bolts, cast-in-place inserts, or threaded studs welded to embedded-steel plates or angles are not provided, attach dock bumpers by drilling and anchoring with expansion anchors and bolts.

C. Installation of Levelers: Attach levelers securely to floor of recessed pit.

3.4 ADJUSTING AND CLEANING

A. Adjust loading dock equipment to function smoothly and safely, and lubricate as recommended by manufacturer.

B. Test dock levelers for vertical travel and adjust to maintain operating range indicated.

C. Restore marred, abraded surfaces to their original condition.

D. After completing installation of exposed, factory-finished loading dock equipment, inspect exposed finishes and repair damaged finishes.

3.5 DEMONSTRATION

A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain loading dock equipment. Refer to Division 1 Sections "Closeout Procedures" and "Demonstration and Training."

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3.6 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of loading dock equipment Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components in accordance with the manufacturer's warranty, lubrication, cleaning, and adjusting as required for proper equipment operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

B. Continuing Maintenance Service: Provide a continuing maintenance proposal from Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

END OF SECTION 111300

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SECTION 113013 - RESIDENTIAL APPLIANCES

All Residential Appliances furnished by Owner install by Contractor.

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Contractor Furnished / Contractor Installed (CFCI) appliances:

   a. Cooking appliances.
   b. Kitchen exhaust ventilation.
   c. Clothes washers.

2. Owner Furnished / Contractor Installed (OFCI) appliances:

   a. Dishwashers.

C. Related Requirements:

1. Owner Furnished / Owner Installed (OFOI) appliances indicated on Drawings.
2. Division 22 sections for kitchen sinks, clothes washers, dishwasher air-gap fittings, and other plumbing items.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Cooking appliances.
2. Kitchen exhaust ventilation.
3. Clothes washers.

B. Product Data Submittals: For each product.

1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

C. Sustainable Design Submittals:

1. Product Data: For indicated products, demonstrating compliance with requirements for ENERGY STAR product labeling.

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D. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard size.

E. Product Schedule: For appliances. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of appliance.

B. Field quality-control reports.

C. Sample Warranties: For manufacturers' special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintains, within 100 miles (160 km) of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

1.7 WARRANTY

A. Provide warranties consistent with requirements of Contract Documents.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain residential appliances from single source and each type of residential appliance from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Gas-Fueled Appliances: Certified by a qualified testing agency for each type of gas-fueled appliance according to ANSI Z21 Series standards.

C. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design, the ABA standards of the Federal agency having jurisdiction, and ICC A117.1.

D. Provide wi-fi enabled appliances for selected specified models.

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2.3 COOKING APPLIANCES

A. General: As indicated on Drawings.

2.4 KITCHEN EXHAUST VENTILATION

A. Overhead Exhaust Hood: As indicated on Drawings.

2.5 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.

C. Examine walls, ceilings, and roofs for suitable conditions where overhead exhaust hoods and microwave ovens with vented exhaust fans will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install appliances according to manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

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3.3 DEMONSTRATION

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

END OF SECTION 113013

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SECTION 118124 - BUILDING MAINTENANCE ACCESS EQUIPMENT

PART 1 - - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Design, supply and installation of fall protection system.

C. Related Requirements:

1. Division 07 Section "Thermoplastic-Polyolefin (TPO) Roofing."
2. Division 07 Section "Sheet Metal Flashing and Trim."

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Fabricate and install the following building maintenance equipment to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections.

1. Fall Arrest Safety Anchors: Design to resist a 5,000 pound load in any direction without detachment or fracture occurring.

a. Design fall arrest safety anchors with a total safety factor of not less than 4 to 1 against overturning moment. Do not reduce safety factor where manufacturer's standard exceeds specified minimum.

1.3 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's catalog data for manufactured components of fall arrest system. Include manufacturer's specifications and installation instructions as applicable.

B. Shop Drawings: Show complete layout and configuration of fall protection system including all components and accessories.

1. Clearly indicate design and fabrication details, hardware, and installation details.
2. Include installation and rigging instructions and all necessary Restrictive and Non-Restrictive working Usage Notes and General Safety Notes.
3. Show details of flashing and waterproofing of fall arrest safety anchor system installation.
4. Provide shop drawings reviewed by a professional engineer in the State of Florida.

1.4 INFORMATIONAL SUBMITTALS

A. Test Reports: Submit upon request.

B. Operation and Maintenance Data: Submit complete data to instruct employees in the safe use of the equipment specified; provide at least the following:

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1. Include:

    a. Manufacturer’s instructions covering maintenance requirements and parts catalog giving complete list of repair and replacement parts with cuts and identifying numbers.
    b. Copy of system Equipment Manual & Inspection Log Book, with "Initial Inspection - Certification for Use" and "Inspection Sign-Off" forms completed.
    c. Two copies of reduced, “as-built shop drawing” showing equipment locations and details. Ensure drawing is posted adjacent exits to roof.

C. Weld Inspection Documentation: Submit weld inspection reports for all welds including shop and field welds. Weld inspection reports shall be in accordance with AWS D1.0.

D. Load Test Data: Submit load test data verifying all building maintenance equipment successfully withstood a test load equal to 2 times the rated load of the equipment after installation.

E. Certification of Compliance: Upon completion of installation, inspection, and load testing, provide a certificate of compliance sealed by a qualified licensed professional engineer registered in the State of Florida, stating that all building maintenance equipment is in compliance with the standards referenced in article "Quality Assurance."

1.5 QUALITY ASSURANCE

A. Source Quality Control: Ensure fall protection equipment components and materials are from single manufacturer.

B. Manufacturer Qualifications: A manufacturer specializing in the design, fabrication and installation of fall protection systems with minimum of 10 years documented experience.

1. Manufacturer’s Insurance: Ensure manufacturer carries liability insurance to protect against product and system failure in amount of five million dollars US ($5,000,000.00) minimum.

C. Installer Qualifications: Employed by manufacturer or approved by University.

D. Regulatory Requirements:

1. Comply with OSHA regulations as follows:

    a. 1910, Subpart D, Walking and Working Surfaces.
    b. Appendix C to 1910 Subpart F, Personal Fall Arrest Systems.

E. Welding: Perform welding using only AWS certified welders. Comply with the following welding codes:

1. AWS D1.1 "Structural Welding Code – Steel."
2. AWS D1.2 "Structural Welding Code – Aluminum."
3. AWS D1.6, "Structural Welding Code - Stainless Steel."

F. Engineer Qualifications: Professional engineer licensed in the State of Florida and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of building maintenance equipment similar in material, design, and extent to that indicated for this Project.

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1.6 DELIVERY, STORAGE AND HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

B. Delivery:

1. Deliver materials in manufacturer's original packaging with identification labels intact and in sizes to suit project.

C. Storage and Protection:

1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1.7 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and does not limit, other rights Owner may have under Contract Documents.

B. Warranty:

1. Term: One year from Material Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. (Basis of Design) Pro Bel Enterprises Limited.
2. Thaler Metal USA.
3. Tractel Group.

B. Design system fall arrest safety anchors and equipment supports to ANSI/IWCA I-14.1, and as follows:

a. Ultimate Load Capacity: 5000 lb.
b. Fall arresting force safety factor of 2 to 1 without permanent deformation: 1800 lbs (8.0 kN) minimum.

2. Roof Deck Mounted Type: U-bar.
3. Material: stainless steel.
4. New Concrete Structure: Anchor bolt cage cast into concrete.

2.2 FALL ARREST SAFETY ANCHORS

A. Roof Mounted Fall Arrest Safety Anchors: Provide roof mounted fall arrest safety anchors consisting of 1-1/2-inch inside diameter stainless steel safety "U" bar welded to galvanized steel

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support tubes with steel plate caps that are welded to steel base plates. Hot dip galvanize all components after fabrication.

1. Anchorage: Anchor fall arrest safety anchors to structure to support indicated loads. Fabricate according to locations and details shown on the Drawings.

2. Welding: Provide fall arrest safety anchors of all welded construction. Make all welds employing certified welders in accordance with AWS D1.0, "Code for Welding in Building Construction" latest edition of American Welding Society. All welds shall be inspected by an AWS CWI.

B. Basis of Specification Products (Pro-Bel Enterprises):

1. Cast in place roof anchor model: PBE74EBD.
2. Recessed cast in place roof anchor model: PBEBAL06.
3. Cast in place wall anchor model: PBE6SP.
4. Recessed cast in place wall anchor model: PBE68S.
5. Weld to structure roof anchor model: PBE75-0000.
6. Provide additional cast in place and welded products as required by encountered field conditions.

C. Safety U-bars: Stainless steel to ASTM A276,Type 304 with 35 Ksi minimum yield strength.

D. U-bar: 0.75 inches (19 mm) minimum diameter material with 1.5 inches eye opening.

E. Safety Anchor Eye Plate: Mild steel, Type 300W with 44 Ksi minimum yield strength, hot-dip galvanized to ASTM A123/A123M.

F. Plate: 0.875 inches diameter material with 2 inches eye opening.

G. Hollow Steel Section (HSS) Piers: Mild steel, Type 300W with 50 Ksi minimum yield strength, hot dipped galvanized to ASTM A123/A123M.

1. Wall thickness as indicated.

H. Plate and other sections: Mild steel, Type 300W with 44 Ksi minimum yield strength, hot dipped galvanized to ASTM A123/A123M.

1. Wall thickness as indicated.

2.3 DOUBLE LANYARD HORIZONTAL LIFELINE SYSTEM

A. Stainless steel to ASTM A492, Type 316, 0.3125 inches minimum diameter cable, 9127 lbs minimum breaking strength with mechanically swedged cable ends.

B. Data plate: Ensure non-corrosive data plate stating Maximum Service Capacity of cable, Manufacturer's Name, Serial No., Manufacturing Date, rated load and other pertinent information is prominently displayed at cable system entry points.

C. Tensioner: Stainless steel turnbuckle to ASTM A167, Type 316.

D. Harness: Manufacturer's standard full body harness with double shock absorber lanyard.

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1. (Basis of Design) Material: Pro-Bel Group, Double Lanyard Horizontal Lifeline System.

2.4 ACCESSORIES:

A. Flashing: Refer to Division 07 "Sheet Metal Flashing and Trim".

B. Miscellaneous Bolts, Nuts and Washers: Stainless steel to ASTM A276, Type 304 with 35 Ksi minimum yield strength.

2.5 FABRICATION, GENERAL

A. Shop Fabrication: Fabricate building maintenance equipment in the shop. Use connections that maintain structural value of joined pieces.

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 exposed work true to line and level with accurate angles and surfaces and straight edges.

D. 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.

E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water.

F. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure building maintenance equipment rigidly in place and to support indicated loads.

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 building maintenance equipment after fabrication.

2.7 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize all ferrous metal items and fasteners to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

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2.8 STAINLESS-STEEL FINISHES

A. Grind and polish surfaces to produce manufacturer's standard uniform, polished finish, free of cross scratches.

2.9 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: AA-M10 (Mechanical Finish: as fabricated, unspecified).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and areas upon which the work of this section depends.

B. Verify site dimensions.

C. Report unsatisfactory site conditions that would cause defective installation of products or cause latent defects in workmanship and function to Design Professional in writing.

D. Start of work will constitute acceptance of site conditions.

3.2 INSTALLATION – GENERAL

A. Provide experienced and qualified technicians to carry out erection, assembly and installation of fall protection equipment system.

B. Compliance: Comply with manufacturer’s written data, including product technical bulletins, product catalog installation instructions and manufacturer’s technical data sheets.

C. Comply with the requirements of 2018 IBC with Florida Amendments for to loading and safety procedures.

D. Install equipment in accordance with approved shop drawings and manufacturer's recommendations.

E. Coordinate installation with work of other installers.

F. Install all work true, level, tightly fitted and flush with adjacent surfaces as required.

G. Fitting and Placement: Perform drilling and fitting required for installing building maintenance equipment. Set building maintenance equipment accurately in location, alignment, and elevation, and in correct relationship to adjacent work.

H. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

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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.
5. All field weld shall be inspected by an AWS CWI.

I. Provide the services of the manufacturer to assist and/or supervise installation of equipment.

3.3 INSTALLATION OF FALL ARREST SAFETY ANCHORS

A. Concrete Supporting Structure: Anchor fall arrest safety anchors to concrete structure by embedding directly in structural concrete roof slabs as shown on the Drawings.

B. Roof Flashing: Refer to Division 07 Section "Polyvinyl Chloride (PVC) Roofing" and "Sheet Metal Flashing and Trim" for installation of roof flashings.

3.4 INSTALLATION OF INTERMITTENT STABILIZATION ANCHORS AND TIE-IN LANYARDS

A. Anchor intermittent stabilization anchors to exterior facade in locations as shown on approved Shop Drawings.

3.5 FIELD QUALITY CONTROL

A. All building maintenance equipment shall be inspected, load tested, and certified for use by manufacturer before being placed into service.

B. Load Testing:

1. The load testing procedure shall be prescribed, in writing, by a registered professional engineer.
2. The load tests shall be performed by qualified persons under the direction of a registered professional engineer.
3. All anchors shall be load tested to 2,500 lbf.
4. The load and deflection shall be measured during load testing to verify no plastic deformation.
5. All load and deflection measuring equipment used shall be calibrated at least annually and calibration records shall be available.
6. Damage to equipment or damage to the building structure from load testing shall be reported to the building owner immediately.
7. A qualified licensed professional engineer registered in the State of Florida shall certify the load testing results.

C. Repair, replace or modify defective installations not conforming to any part of the specification.

D. Provide certification of compliance stamped by a Florida licensed professional engineer verifying system is ready for use.

3.6 ADJUSTING AND CLEANING

A. Adjustments: Check and adjust operating items. Leave work in complete and proper operating condition. Remove and replace defective work.

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B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.7 PROTECTION

A. Protect installed product from damage during construction.

B. Repair or replace damage to adjacent materials caused by fall protection equipment installation.

END OF SECTION 118124

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122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes, but is not limited to:

1. Manually operated roller shades with single rollers.
2. Motor-operated roller shades with double rollers.

B. Related Requirements:

1. Division 07 Section "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.
2. Division 09 Section "Gypsum Board Assemblies" for framing and gypsum board for mounting roller shades and accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples: For each exposed product and for each color and texture specified, 10 inches (250 mm) long.

D. Samples for Initial Selection: For each type and color of shadeband material.

1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 10 inches (250 mm) square. Mark interior face of material if applicable.
2. Roller Shade: Full-size operating unit, not less than 16 inches (400 mm) wide by 36 inches (900 mm) long for each type of roller shade indicated.
3. Installation Accessories: Full-size unit, not less than 10 inches (250 mm) long.

F. Product Schedule: For roller shades.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material.

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C. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source from single manufacturer.

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

1. Draper Inc.
2. Lutron Electronics Co., Inc.
3. MechoShade Systems, Inc., (Basis of Design).
4. Standard Textile Company, Inc.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Stainless steel.

a. Loop Length: Full length of roller shade.
b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Chain tensioner, jamb mounted.

2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.

a. Provide for shadebands that weigh more than 10 lb (4.5 kg) or for shades as recommended by manufacturer, whichever criterion is more stringent.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of interior face of shade.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Shadebands: Refer to Drawings for applications of each type of fabric.

1. Shadeband Material (**WT-01**): Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material.
b. Color and Finish: As selected by Architect from manufacturer's full range.

E. Installation Accessories:

1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.

a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 5 inches (127 mm).

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b. Provide pocket with lip at lower edge to support acoustical ceiling panel.

2. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.

a. Closure-Panel Width: As indicated on Drawings.

3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 MOTOR-OPERATED, DOUBLE-ROLLER SHADES (WT-02)

A. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and 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 building electrical system.

1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.

a. Electrical Characteristics: Refer to electrical drawings.
b. Maximum Total Shade Width: As required to operate roller shades indicated.
c. Maximum Shade Drop: As required to operate roller shades indicated.
d. Maximum Weight Capacity: As required to operate roller shades indicated.

3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:

a. Individual/Group Control Station: Maintained-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for individual and group control.
b. Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features; isolated from voltage spikes and surges.
c. Color: As selected by Architect from manufacturer's full range.

4. Crank-Operator Override: Crank and gearbox operate shades in event of power outage or motor failure.
5. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
6. Operating Features:

a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
b. Capable of interface with audiovisual control system.
c. Capable of accepting input from building automation control system.
d. Override switch.

7. Accessories:

a. TBD.

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B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: As indicated on Drawings.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

F. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

G. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers that are operated by one roller drive-end assembly.

H. Shadebands:

1. Shadeband Material (**WT-01**): Light-filtering fabric.
2. Shadeband Material (**WT-02**): Light-blocking fabric.
3. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
    a. Type: Enclosed in sealed pocket of shadeband material.
    b. Color and Finish: As selected by Architect from manufacturer's full range.

I. Installation Accessories:

1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
    a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 5 inches (127 mm).
    b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
2. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.4 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric (WT-01): Woven fabric, stain and fade resistant.

1. Source: Mechoshade “EcoVeil 1550.”
2. Type: 100% thermoplastic olefin (TPO).
3. Weave: Basketweave.
4. Roll Width: As indicated on the drawings.
5. Orientation on Shadeband: Up the bolt.
6. Railroading: Yes.
7. Openness Factor: 3.0 percent.
8. Color: As indicated on Drawings.
9. Fabric Performance Assurance capable of meeting the tolerances below:

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a. Openness factor tolerance: (+/-0.75 percent).
b. Visible light transmittance (Tv) tolerance: (+/-1 percent) or (+/-20 percent x Tv).
c. Certification Documentation: All rolls of fabric must be certified to comply with the Fabric Performance Requirements. Provide documentation with each roll verifying the statistical requirements for fabric tolerance are met for all rolls of fabric in the manufacturing lot.

J. Light-Blocking Fabric (**WT-02**): Opaque fabric, stain and fade resistant.

1. Source: Mechoshade “Blackout 2820 Series.”
2. Type: 100% glass yarn, acrylic coated + white flock.
3. Roll Width: As indicated on the drawings.
4. Orientation on Shadeband: Up the bolt.
5. Railroading: Yes.
6. Features: Washable.
7. Color: As indicated on Drawings.

2.5 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 degrees F (23 degrees C):

1. Outside of Jamb Installation: 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.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches (51 mm) to interior face of glass. Allow clearances for window operation hardware.

B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

C. Shade Locations: As indicated on Drawings.

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.

3.5 DEMONSTRATION

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

END OF SECTION 122413

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SECTION 123661.16 - SOLID SURFACING COUNTERTOPS

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 surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material end splashes.
4. Solid surface material apron fronts.
5. Solid surface material sinks.

B. Related Requirements:

1. Division 22 “Plumbing” sections for non-integral sinks and plumbing fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials and sinks.

1. Product Data: For adhesives, indicating VOC content.
2. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
3. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Initial Selection: For each type of material exposed to view.

D. Samples for Verification: For the following products:

1. Countertop material, 6 inches (150 mm) square.
2. Wood trim, 8 inches (200 mm) long.
3. One full-size solid surface material countertop, with front edge and backsplash, 8 by 10 inches (200 by 250 mm), of construction and in configuration specified.

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1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

1. Build mockup of typical countertop 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.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.

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

    a. Avonite Surfaces.
    b. E. I. du Pont de Nemours and Company.
    c. Formica Corporation.
    d. Wilsonart LLC.

2. Integral Sink Bowls: Comply with CSA B45.5/IAPMO Z124.
3. Colors and Patterns: As selected by Architect from manufacturer's full range.

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4. Certified Wood: Wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001 and FSC STD-40-004.

B. Composite Wood Products: Products shall be made without urea formaldehyde.

C. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.

E. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Custom.

B. Configuration: As indicated on Drawings.

C. Countertops: 3/4-inch- (19-mm-) thick, solid surface material with front edge built up with same material.

D. Backsplashes: 3/4-inch- (19-mm-) thick, solid surface material.

E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Install integral sink bowls in countertops in the shop.

F. Joints: Fabricate countertops without joints.

G. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

   a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.
   b. Provide vertical edges, rounded to 3/8-inch (10-mm) radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch (5 mm) into fixture opening.
   c. Provide 3/4-inch (20-mm) full bullnose edges projecting 3/8 inch (10 mm) into fixture opening.

2. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
3. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

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2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

2.4 ACCESSORIES

A. Acrylic Splash Guards:

1. Basis of Design Product: Global Equipment Company Inc; “Splash Guard, Medium, 4-1/2"W x 21-1/4"D x 18"H, Clear.”
2. Characteristics:

a. Configuration: Manufacturer’s standard preassembled shield with base plate.
b. Material: Clear acrylic sheets.
c. Base Plate Width: 4-1/2 inches.
d. Shield Height: 18 inches.
e. Shield Depth: 21-1/4 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m), 1/4 inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.

B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

D. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

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E. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

F. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

G. Apply sealant to gaps at walls; comply with Division 07 Section "Joint Sealants."

END OF SECTION 123661.16

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SECTION 124813 - ENTRANCE FLOOR MATS AND FRAMES

Entrance Floor Mats provided by Owner

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Prefabricated modular entrance floor mat system consisting of:

a. Planks comprised of multiple interlocking tread rails with textile inserts.
b. Perimeter frame finishing kit for surface-mounted installation comprised of edge ramps, corners, and connectors.

1.2 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 floor mats and frames.

B. Shop Drawings:

1. Items penetrating floor mats and frames, including door control devices, as applicable.
2. Layout of planks.
3. Perimeter floor finishing kit layouts.

C. Samples: For the following products, in manufacturer's standard sizes:

1. Floor Mat Planks: Assembled 12 by 12 inches (300 by 300 mm) sections of floor mat plank.
2. Tread Rails: Sample of each type and color.
3. Finishing Kit Members: Sample of each type and color.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For floor mats and frames to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Prefabricated Mat Planks: Full-size units equal to 2 percent of amount installed, but no fewer than 10 standard length units.

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PART 2 - PRODUCTS

2.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

A. Structural Performance: Provide prefabricated mats and frames capable of withstanding the following loads and stresses within limits and under conditions indicated:

1. Uniform floor load of 300 lbf/sq. ft. (14.36 kN/sq. m).
2. Wheel load of 350 lb (159 kg) per wheel.

B. Accessibility Standard: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following:

1. Babckock-Davis.
2. Construction Specialties, Inc.
3. Milliken.

B. Basis of Design Product: Milliken “OBEX Bar.”

2.3 MODULAR RAIL MAT PLANKS

A. Plank characteristics are those for basis of design product.

B. Modular Aluminum-Rail Mats: Planks with multiple extruded-aluminum tread rails 7/16 inch (11 mm) thick, each rail sitting on continuous HDPE strip backing.

C. Overall Mat Size and Layout: As indicated on Drawings.

D. Planks:

1. Plank Size: 10.87 inches x 39.37 inches (27.6 cm x 100 cm).
2. Bar Material: Extruded aluminum profile with HDPE cushion backing.
3. Nominal Total Plank Thickness: 0.43 inch (11 mm).
4. Textile Inserts:

    a. Construction: Tufted, Cut Pile.
    b. Yarn Type: Milliken-Certified WearOn Nylon and Monofilament.
    c. Dye Method: Solution-dyed.

2.4 FABRICATION

A. Floor Mat Planks: Shop fabricate plank units to greatest extent possible in sizes indicated.

B. Surface-Mounted Frames: As indicated for permanent surface-mounted installation, complete with corner connectors, splice plates or connecting pins, and postinstalled expansion anchors.

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C. Coat concealed surfaces of aluminum frames that contact cementitious material with manufacturer's standard protective coating.

2.5 ALUMINUM FINISHES

A. Manufacturer’s standard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, sizes, and other conditions affecting installation of floor mats and frames.

1. Ensure substrates and flat and level.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install surface-type units to comply with manufacturer's written instructions; coordinate with entrance locations and traffic patterns.

1. Install planks in ashlar pattern.
2. Anchor fixed surface-type frame members to floor with devices spaced as recommended by manufacturer.

3.3 PROTECTION

A. After completing frame installation cover entrance mat with plywood protective flooring. Maintain protection until date of Substantial Completion.

3.4 CLEANING

A. Upon removal of temporary protection thoroughly vacuum mats and follow with hot-water extraction cleaning.

END OF SECTION 124813

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SECTION 131213 - EXTERIOR FOUNTAINS

NOT USED

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Design and complete installation of decorative fountains as indicated on Drawings and specified, including:
    a. Equipment and accessories indicated on Drawings.
        1) Fountain display system including pumps, valves, and specialties (nozzles, pool fittings, etc.).
        2) Fountain electrical control system including control panel with water level control, time switches, relays, motor starters, grounding system, PLC circuits and accessories as required, UL 508 Listed.
        3) Filtration and water treatment system, media, accessories, and controls.
        4) Drain, water makeup and overflow equipment, and controls.
    b. Mechanical, electrical, and plumbing work.

C. Related Requirements:

1. Division 03 Section “Cast-in-Place Concrete” for cast-in-place concrete substrates and foundations.
2. Division 04 Sections for material and setting requirements for face brick, cast stone, and CMU components.
3. Divisions 22 and 26 Sections for plumbing and electrical requirements including connections to water supply, sanitary sewer, and electrical power.

1.2 DEFINITIONS

A. Fountains and water features include: concrete fountains and linings, decorative rock work, waterproofing, water pump and filters, sensors and controllers, valves, nozzles, drains, piping, valve and junction boxes, electrical power and lighting, and other incidental work.

1.3 PREINSTALLATION CONFERENCE

A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section “Project Management and Coordination.”

1. Review locations for pools, fountains, and water features.
2. Review required coordination with other Work.
3. Review locations and sizes for required utilities including service requirements.

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1.4 COORDINATION

A. Coordinate the work of this Section with applicable trades and appropriate sections of the Project Manual.

B. Review space limitations and unusual requirements, for the installation of materials and work provided under this section. Although the location of equipment may be indicated on Drawings in certain configurations, be guided by the Architectural details and conditions at the project site.

C. Bring any discrepancies and interferences to the attention of the Architect for resolution prior to proceeding with the work.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product required. Where applicable, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1. For pumps and light fixtures, include wiring diagrams, power requirements, rated capacities, furnished specialties, and accessories.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

1. Include piping layout for plumbing work indicating location of valves, pumps, piping, and nozzles.
2. Include wiring diagrams indicating connections to electrical service and type of service required for electrical components including pumps, sensors, controllers, and lighting.

C. Samples for Initial Selection: For each type of finish material required.

D. Samples for Verification: For each type of finish material required.

1.6 INFORMATIONAL SUBMITTALS

A. Warranties: Special warranties specified in this Section.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For operating components of fountains, pools, and water features to include in operations and maintenance manuals.

1. Provide a complete schedule of lubrication of rotating equipment within the equipment literature binder.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An installer of decorative fountains and pools with not less than 5 years' experience executing work of similar scope.

1. Installer's responsibilities include design, fabricating, and installing fountains, pools, and water features and providing professional engineering services needed to assume engineering responsibility.
2. Approved Installers:
    a. Monarch Pool Incorporated

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b. Patio Pool of Houston Inc.
c. Watts Pool Company

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Product Options: Information on Drawings and in Specifications establishes requirements for system's 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 field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Landscape Architect, except with Landscape Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.9 FIELD CONDITIONS

A. Field Measurements:

1. Indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating without field measurements. Coordinate plaza construction to ensure that actual dimensions correspond to established dimensions.

1.10 WARRANTY

A. Special Warranty: Installer's standard form in which Installer agrees to repair or replace fountain and pool components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including cracking in cast stone and ceramic tile finishes.
b. Leaking of pools through fountain and pool structure, piping, or waterproof membranes.
c. Faulty operation of nozzles, pumps, filters, and electrical lighting.

2. Warranty Period: 2 years from date of Substantial Completion.

B. Special Warranty for Operating Components: Manufacturer's standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Components:

a. Pumps.
b. Filters.
c. Electrical light fixtures.

2. Warranty Period: 5 years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. Design Effects: To be finalized during Construction Documents design phase.

1. Include the following components:

a. Pop water jets.
b. Smooth-bore nozzles with RGB lights.

2.2 PERFORMANCE REQUIREMENTS

A. Fabrication Engineering and Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements." Provide a comprehensive engineering analysis based on design criteria and performance requirements indicated.

B. Structural Performance: Provide exterior fountain decorative elements capable of withstanding the effects of gravity loads under conditions indicated.

C. Operational Performance:

1. Design fountain with appropriate overflow drains that prevent water from flowing onto adjacent areas.
2. Design systems and select components to achieve indicated effects with reliable operation and minimal maintenance.
3. Design for satisfactory operation in ambient temperatures from 35 degrees to 110 degrees F.

2.3 MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following:

1. Delta Fountains,
2. Roman Fountains Corporation.
3. The Fountain People, Inc.

2.4 PRODUCTS

A. Basis of Design: Design intent for exterior fountains is based on products by Delta Fountains.

1. Subject to compliance with requirements, provide products by named manufacturer or comparable products approved by the Landscape Architect.

2.5 PIPES, TUBES, AND FITTINGS

A. PVC Pipe: ASTM D1785, PVC 1120 compound, Schedule 40.

1. PVC Socket Fittings, Schedule 40: ASTM D2466.

B. PVC, Pressure-Rated Pipe: ASTM D2241, PVC 1120 compound, SDR 26.

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1. PVC Socket Fittings, Schedule 80: ASTM D2467.

C. Solvent Cements for Joining PVC Piping: ASTM D 564. Include primer according to ASTM F656.

D. Welded Steel Piping Assemblies: Galvanize after fabrication.

2.6 CONTROLLERS

A. Provide manufacturer's proprietary show controller with the following capabilities:

1. Programmable to create a minimum of (8) shows, each consisting of up to 340 combinations of unique LED light addresses and water jet pulses.

B. Controller Features:

1. NEMA Type 4X enclosure, with IP65 rating.
2. Integrated proprietary time clock.
3. Minimum 7-inch LED touch screen with manufacturer's proprietary Graphic User Interface (GUI).
4. Wi-Fi Antenna: Manufacturer's standard.
5. Ethernet connection.
6. Micro-SD slot.

C. Proprietary Software: Manufacturer's software designed to control operation of exterior fountains of the scope and complexity of system specified.

1. Provide software with strong password protection feature.

D. Remote Cloud-Based Access Devices: Manufacturer's standard.

1. Furnish two (2) devices.

2.7 STONE

A. Provide natural stone and boulders approximating sizes indicated for selection by the Landscape Architect.

1. Refer to Division 32 Section "Boulders."

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 31 Earthwork applicable sections for excavating, trenching, and backfilling.

3.2 PREPARATION

A. Set stakes to identify locations of proposed fountains, pools, and water features. Obtain Architect's approval before excavation.

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3.3 INSTALLATION

A. General: Install fountains and water features in locations indicated in accordance with approved Shop Drawings. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated.

B. Utility Connections: Make water, electrical, and storm sewer connections from lines indicated on Drawings to equipment and fixtures required for fountains, pools, and water features.

C. In-Ground Vault and Box Installation: Install in approved locations and at approved elevations.

D. Piping Installation:

1. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.
2. Install piping free of sags and bends.
3. Install fittings for changes in direction and branch connections.
4. Install unions adjacent to valves and to final connections to other components with NPS 2 or smaller pipe connection.
5. Install flanges adjacent to valves and to final connections to other components with NPS 2-1/2 or larger pipe connection.
6. Install underground thermoplastic piping according to ASTM D2774.
7. Lay piping on solid sub-base, uniformly sloped without humps or depressions.
8. Install PVC piping in dry weather when temperature is above 40 degrees F (5 degrees C). Allow joints to cure at least 24 hours at temperatures above 40 degrees F (5 degrees C) before testing unless otherwise recommended by manufacturer.
9. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
    a. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
    b. PVC Pressure Piping: Join schedule number ASTM D1785, PVC pipe and PVC socket fittings according to ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D2855.
    c. PVC Non-Pressure Piping: Join according to ASTM D2855.
10. Pipe Protection:
    a. Copper or brass piping, encased in concrete: Wrap exterior with one layer of pipe wrap at half lap.
    b. Copper or Brass Piping, Underground: Coat exterior with two coats of coal tar mastic to a total thickness of 8 to 10 mils. Allow 12 hours drying time between applications. Clean and prepare pipe exterior in accordance with manufacturer's recommendations.
    c. Galvanized steel piping, underground, submerged, or encased in concrete: Coat exterior with two coats of coal tar mastic to a total thickness of 8 to 10 mil. Allow 12 hours drying time between applications. Clean and prepare pipe exterior in accordance with manufacturer's recommendations.
11. Penetrations:
    a. Accomplish core drilling for pipe penetrations only at locations and in a manner approved by the Architect.
    b. Provide a metal or approved plastic sleeve or core-drilled hole for every pipe passing through a concrete wall or floor.

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c. Provide a water stop or membrane clamp for every pipe or sleeve penetrating an exterior concrete wall or floor or the fountain wall or floor, whichever is appropriate to the waterproofing method and/or as shown on Drawings.
d. Seal sleeves passing through interior walls with foam sealant, unless otherwise indicated on the Drawings.
e. Seal sleeves passing through exterior walls with resilient seal and foam sealant, unless otherwise indicated on the Drawings.

E. Stone Installation: Install selected natural stone and boulders in locations indicated and as approved by the Architect. Where required for proper operation or safety, securely attach stones with mechanical fasteners or mortar/grout.

F. Equipment Installation:

1. Install equipment level and plumb, unless otherwise indicated.
2. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.
3. Install equipment to allow right of way to piping systems installed at required slope.

3.4 FIELD TESTING

A. Piping Tests, General:

1. Provide all temporary piping, pumps, and gauges necessary to conduct the specified tests.
2. Conduct all tests before concealment of work and before any coating, wrap, or insulation is applied.
3. Replace or repair any part that leaks. Repeat test until criteria are met.
4. Do not subject any item to a test pressure greater than the pressure rating of the item. Vent air from all piping being tested.

B. Underground Piping Testing:

1. In accordance with pipe manufacturers' recommendations and procedures, pressurize underground piping (except for drain system) to 75 psi prior to backfilling (spot backfilling to anchor piping may be done prior to pressurizing). Keep piping pressurized until backfilling, grading, planting, and concrete work in the area of the piping is completed.
2. In accordance with pipe manufacturers' recommendations and procedures, pressurize underground drain piping beneath the equipment space to 15 psi until backfilling and concrete work in the area is completed.

C. Completed Piping System Testing:

1. Conduct each test for a minimum continuous duration of eight hours. Hydrostatically pressure test storm and sanitary drain piping at 15 psi. Hydrostatically pressure test other piping and equipment at 75 psi.
2. Strike solder joints with a soft-face hammer while under pressure.
3. Log pressure readings for tests required above at the beginning and end of each test and on every working day between. Note the location and cause of any failures and method of repair on the daily log.

a. Submit copy of the log to the Architect weekly.
b. Ensure testing of the completed system, as specified above, is witnessed by the Architect.

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3.5 CLEANING

A. Flushing:

1. Before the fountain system is placed in operation, flush fountain system piping with water to remove foreign matter and debris in piping.
2. Completely drain piping and equipment. Re-flush as necessary until water runs clean. Fill the system to the required capacity with clean water.
3. Circulate the water throughout the system for one hour, using the display pump. Install start-up screens as necessary to prevent equipment clogging and damage.
4. Drain, fill, and circulate (repeat previous three steps above) until the water remains clear.

3.6 ADJUSTING

A. Alignment and lubrication of rotating equipment:

1. After installation, align pumps connected to motors by means of flexible couplings, if necessary, to within the tolerance limits recommended by equipment and coupling manufacturers.
2. Before any rotating equipment is put in operation for testing purposes, properly lubricate with lubricants recommended by equipment manufacturer. Further lubricate before final acceptance. Provide a complete schedule of lubrication of all rotating equipment within the equipment literature binder.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain pumps, filters, programmable components, and lighting. Refer to Division 1 Section “Closeout Procedures.”

END OF SECTION 131213

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SECTION 133100 - TENSILE MEMBRANE STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this Section in accordance with requirements of the Contract Documents.

B. Section includes, but is not limited to:

1. Exterior architectural tensile membrane canopy structure system.

C. Related Requirements:

1. Division 01 applicable sections for General Requirements.
2. Division 03 applicable sections for cast-in-place concrete foundations.
3. Division 05 applicable sections: for structural metal framing, metal fabrications, expansion control systems, and shop-applied metal coatings.
4. Division 09 Section “High-Performance Coatings.”

1.2 FLORIDA PRODUCT APPROVAL COMPLIANCE

A. Exterior building products and assemblies shall be approved by Florida Building Codes and Standards Product Approval.

Florida Building Codes and Standards
Florida Building Commission
Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
Telephone (850) 487-1824
www.floridabuilding.org

B. Comply with applicable Product Approval Rules (61G 20-3 and 9N-3, formally known as Rule 9B-72). For each product installed in the exterior building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or
2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code.

1.3 REFERENCES

A. General: Except as otherwise indicated, comply with requirements of the following codes and standards:

1. American Institute of Steel Construction (AISC):

a. AISC/ANSI 360 Specification for Structural Steel Buildings.
b. AISC 303 Code of Standard Practice for Steel Buildings and Bridges.
c. AISC/ANSI 341 Seismic Provisions for Structural Steel Buildings.

2. American Society of Civil Engineers (ASCE):

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a. ASCE 19: Structural Applications of Steel Cables for Buildings.

3. American Society for Testing and Materials (ASTM):

a. ASTM A586: Standard Specification for Zinc-Coated Steel Structural Strand.
b. ASTM A603: Standard Specification for Zinc-Coated Steel Structural Wire Rope.
c. ASTM D4851: Standard Test Methods for Coated and Laminated Fabrics for Architectural Use.
d. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
e. ASTM E108: Standard Test Methods for Fire Tests of Roof Coverings.
f. ASTM E136: Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.
g. ASTM C423: Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
h. ASTM E424: Standard Test Method for Solar Energy Transmittance and Reflectance of Sheet Materials.

4. American Welding Society (AWS):

a. AWS D1.1: Structural Welding Code.
b. AWS 2.4: Symbols for Welding and Nondestructive Testing.

5. Aluminum Association:

a. Specifications for Aluminum Structures.

6. National Fire Protection Association (NFPA):

a. NFPA 701: Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

7. Society for Protective Coatings (SSPC):

a. Steel Structures Painting Manual, Volumes 1 and 2.

1.4 ACTION SUBMITTALS

A. Product Data: Include manufacturer's specifications for materials, fabrication, installation, and recommendations for maintenance. Include test reports showing compliance with project requirements where test method is indicated.

1. Samples: Submit selection and verification samples.

B. Shop Drawings: Include drawings defining the completed structure, anchorage and connection details, interfaces with building construction, and general membrane seam arrangements.

1. Membrane Assembly Shop Drawings: Include information necessary for the fabrication by the Installer of the tensile membrane structure. Include size and shape of envelope, type and location of shop and field connections, size, type, and extent of heat-welded seams.
2. Structural Steel Submittals:
    1) Indicate shop and erection details including cuts, copes, connection holes, threaded fasteners, bolts, studs and spacing, etc.
    2) Indicate welds, both shop and field, by the currently recommended symbols of the AWS.
    3) Welding procedures for welds that are not prequalified.

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1.5 INFORMATIONAL SUBMITTALS

A. Quality Assurance Submittals.

1. Test Reports: Provide test reports from a qualified testing laboratory that show compliance of the Subcontractor's PTFE-coated woven fiberglass tensile membrane system with specification requirements, as follows:

    a. Physical test data of the actual fabric roll goods to be used in the project confirming conformance with specifications for the membrane.

2. Certificates, General: Product certificates signed by the Subcontractor certifying materials comply with specified characteristics, criteria, and physical requirements.
3. Certificates for Structural Steel: Certification of material conformance that includes chemical and physical properties for structural elements.

1.6 CLOSEOUT SUBMITTALS

A. Warranty: Project Warranty documents as described herein.

B. Record Documents: Project record documents for installed materials in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

C. Maintenance Manual: Submit two (2) copies of a maintenance manual for the tensile membrane structure to the Owner. Include a schedule for routine inspection, an inspection checklist, instructions for emergency repair and use of emergency repair materials, and warranty.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1. Installer Responsibilities: Fabrication engineering and design, detailing, fabrication, supplying, and installation of the Work specified.

    a. Include, in the Work the following principal items:

        1) The architectural membrane as indicated on Drawings and in specifications.
        2) Cables and end fittings.
        3) Perimeter, catenary, and sectionalized aluminum clamping system.
        4) Structural steel, including masts, trusses, struts, beams, and/or weldments, as indicated on Drawings.
        5) Fasteners and gasketing.

1.8 PRODUCT DELIVERY, HANDLING, AND STORAGE

A. General: Refer to the Conditions of the Contract for product handling provisions.

B. Pack, load, ship, unload, store, and protect materials a manner that will avoid abuse, damage, and defacement.

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1.9 WARRANTY

PART 2 - Products

2.1 DESIGN CRITERIA

A. Fabrication Engineering and Design: For tensile membrane structures indicated to comply with performance requirements, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include calculations supporting engineering design decisions.
2. Indicate types, connections, types of reinforcement, types of assembly stiffeners, and other aspects of structural engineering. Indicate location, type, magnitude, and direction of loads imposed on facility's structural elements.

B. Regulatory Criteria: Comply with requirements of the State of Florida Building Code, Eighth edition.

2.2 PERFORMANCE REQUIREMENTS

General: Provide a structural tensile membrane system that complies with requirements specified herein by testing the Subcontractor's corresponding membrane system in accordance with the indicated test methods.

1. Ground Snow Load: As indicated on Structural Drawings.
2. Snow Load Importance Factor: As indicated on Structural Drawings.
3. Roof Live Load: As indicated on Structural Drawings.
4. Basic Wind Speed: As indicated on Structural Drawings.
5. Wind Load Importance Factor: As indicated on Structural Drawings.
6. Wind Exposure Category: As indicated on Structural Drawings.
7. Design Mean Roof Height(s): As indicated on Structural Drawings.

B. Life Safety: Detail tensile membrane structures so that no life safety issues are created in the event of a loss of a part of the membrane. Ensure tensile membrane structure does not rely on the membrane for structural stability.

C. Fire Performance: Range of characteristics required of membranes:

1. Burning Characteristics (ASTM E84).
    a. Flame Spread: 5 max.
    b. Smoke Generation (Tunnel Test): 20 max.
2. Fire Resistance of Roof Coverings (ASTM E108).
    a. Burning Brand: Class A.
3. Incombustibility of Substrates (ASTM E136).
    a. Substrate Noncombustible: Pass.
4. Flame Resistance (NFPA 701 Small Scale, UL 94).
    a. Flame Out: 1 second after
    b. Char Length: 0.25-inch, max.

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2.3 QUALIFIED INSTALLERS

A. Birdair, Inc.

2.4 ARCHITECTURAL MEMBRANE

A. Tensile Membrane: Polytetrafluoroethylene ("PTFE," such as Teflon) coated woven fiberglass.

B. General Requirements:

1. Source Quality Control: Obtain primary materials from a single manufacturer. Obtain secondary materials from sources recommended by the primary manufacturer.
2. Physical Characteristics:
    a. Coated Fabric Weight (oz./sq. yd.): 24 min. to 45.5 nom. (ASTM D4851).
    b. Thickness (mils): 18 min. to 36 nom. (ASTM D4851).
    c. Strip Tensile (lbs./in., avg.):
        1) Dry, Warp: 520 min. to 975 min. avg. (ASTM D4851).
        2) Dry, Fill: 380 min. to 900 min. avg. (ASTM D4851).
    d. Strip Tensile, After Crease Fold: (lbs./in., avg.):
        1) Dry, Warp: 375 min. to 760 min. avg. (ASTM D4851).
        2) Dry, Fill: 350 min. to 735 min. avg. (ASTM D4851).
    e. Trapezoidal Tear (lbs./in., avg.):
        1) Warp: 35 min. to 95 min. avg. (ASTM D4851).
        2) Fill : 35 min. to 120 min. avg. (ASTM D4851).
    f. Solar Transmission (%): 7 to 22 nom. (ASTM E424).
    g. Solar Reflectance (%): 70 to 73 nom. (ASTM E424).

C. Materials.

1. Base Fabric Yarns: Commercial quality, essentially free of broken fibers and fully suitable for coating. Weave fabric with uniform tension and crimp in the warp and fill yarns and ensure it is free of defects deleterious to the coating process.
2. Fluorocarbon Coatings: Fluorocarbon resins formulated specifically for architectural applications. Apply coatings to form a weatherized barrier between the fiberglass yarns and the environment.
    a. Bulk of Coating: Formulated dispersions of PTFE fluoropolymer resin and additives to enhance abrasion and tear resistance, impart pigmentation, or modify solar transmission.
        1) Additives Content Limitations: Constituting no more than 20 percent by weight of the total coating or 25 percent by weight of any individual layer. T
        2) Surface: Completely a fluoroethylenepropylene (“FEP”) resin to facilitate heat welding.
3. After weaving, clean base fabric and prime it to achieve optimum mechanical properties of the coated membrane. Ensure the coating is virtually free of mud cracks and pinholes. Apply coating evenly to both sides of the fabric
    a. Ensure FEP fluorocarbon resin topcoat is of sufficient thickness to permit proper heat fusion of joints with the recommended die pressure and temperature.

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2.5 CABLES AND END FITTINGS

A. Materials.

1. Structural Wire Rope Cables: Comply with requirements of ASTM A603.
2. Structural Strand Cables: Comply with requirements of ASTM A586.
3. Coating for Cables: “Class A” zinc coating throughout.
4. Cables in Contact with the Membrane: PVC coated.

B. Fabrication.

1. Prestretch cables that are designated to be prestretched in accordance with ASTM A603 for wire rope and ASTM A586 for structural strand.
    a. Cables of the Same Type: Same modulus of elasticity.
2. Manufacture cables to the following length tolerances at 70 degrees Fahrenheit (23 degrees Celsius):
    a. Length < 70 feet (213 meters): ¼ inch (6.4 mm)
    b. Length 70 to 270 feet (32.3 to 82.3 meters): 0.03 percent of length
    c. Length > 270 feet (82.3 meters): 1 inch (25.4 mm)
3. Fabricate cables with a continuous longitudinal paint stripe (¼ inch wide max.) along their top surface unless noted otherwise.
4. Visible Index Markings: A circumferential paint stripe (¼ inch wide max.).
5. Deliver cables and end fittings clean and dry.
6. Swaged and Speltered Fittings: Designed and attached to develop the full breaking strength of the cable.
7. Thimble End Fittings: Designed and attached develop a minimum of 90% of the cable breaking strength.
8. Swaged end fittings, pins, nuts, and washers: Hot dip galvanized in accordance with ASTM A153. Clean any damage to the zinc coating and paint with a gray zinc-rich paint per ASTM A780.
9. Speltered End Fittings: Hot dip galvanized in accordance with ASTM A153. Clean any damage to the zinc coating and paint with a gray zinc-rich paint per ASTM A780.

2.6 ALUMINUM CLAMPING SYSTEM

A. Materials:

1. Structural Aluminum Clamping Systems: ASTM B221/B221M, alloy 6061,T6 temper.
2. Bent Plates: Formed from ASTM B209/B209 M, alloy 6061, T6 temper.
3. Structural “U straps”: Stainless steel, ASTM A666, Type 316.
4. Structural aluminum clamping finish:
    a. [**Clear anodized per MIL-A-8625C Type 2, Class 1.**]
    b. [**Polyester thermosetting powder coating with a tri-glycidyl isocyanurate (i.e. TGIC) curing agent/hardener per American Architectural Manufacturers Association (AAMA) 2603 to a thickness of 3 mils, white in color.**]
5. Structural Sheet Aluminum: ASTM B209/B209M, alloy 5052, H32 temper.
6. Non-Structural Sheet Aluminum: ASTM B209/B209M, alloy 1100 series.

B. Fabrication:

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1. Provide effective quality control over fabrication activities. Inspection of the place of fabrication may occur at any time to verify proper quality control. This inspection does not relieve the fabricator from meeting the requirements of this Section.
2. Fabricated aluminum without sharp edges.
3. Stamp parts with the appropriate mark number.
4. Fabricate aluminum free of oil, grease, and machining chips.
5. Tolerances:
    a. Cross Sectional Dimensions: Plus or minus 10 percent, 0.03-inch (0.8 mm) max.
    b. Bolt Hole Locations: Plus or minus 1/32 inch (0.8 mm).
    c. Overall Length: Plus or minus 1/16 inch (1.6 mm).
6. Welded Joints: Conforming to requirements of AWS D1.2.

2.7 STRUCTURAL STEEL

A. General: Comply with the latest revision of applicable codes, standards, and regulations including the following:

1. ASTM: (as referenced).
2. AISC: “Specification for Structural Steel Buildings” and “Code of Standard Practice for Steel Buildings and Bridges.”
3. SSPC: “Steel Structures Painting Manual, Volumes 1 and 2.”
4. Research Council on Riveted and Bolted Structural Joints: “Specification for Structural Joints Using ASTM A325 or A490 Bolts.”
5. AWS D1.1 and AWS A2.4.

B. In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards or these specifications, the more stringent provision will govern.

C. Materials:

1. Structural Steel for Plates and Bars: ASTM A36/A36M or ASTM A572/A572M, Grade 50, unless noted otherwise.
2. Structural Pipe: ASTM A53, Types E or S, Grade B.
3. Structural Tubing: ASTM A500, Grade B.
4. Structural Bolts.
    a. High Strength Bolts: ASTM A325, unless noted otherwise.
    b. Common Bolts and Nuts: ASTM A307.
    c. Threaded Rods: ASTM A36/A36M, unless noted otherwise.
5. Other Materials: Provide new, free from rust, first quality of their respective kinds, materials not specifically described but required for a complete and proper installation of structural steel.
6. Materials are subject to approval by Installer.

D. Accessories:

1. Base Plates and Anchor Bolts.
    a. Furnish and set on shims, base plates, leveling plates or leveling nuts supported on concrete, whether shop attached or shipped loose.
        1) Contractor Responsibilities: Grouting.
    b. Installer Responsibilities : Furnishing anchor bolt locations to be used by Contractor to set the bolts.

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c. Contractor Responsibilities: Checking setting of the bolts to their proper position prior to placing of concrete.

1) Contractor's Anchor Bolts: Include two (2) nuts and washers. Repair or cut damaged threads to permit full tightening of nuts.

E. Fabrication:

1. Workmanship: Ensure members, when finished, are true and free of twists, bends, and open joints between the component parts. Thoroughly straighten structural members in the shop by methods that will not injure them, before being worked on in any way.

a. Properly mark materials, and match-mark when directed by the Subcontractor, for field assembly.
b. Grind edges and corners that could contact membrane to a minimum 1/16" (1.6mm) radius.

2. Connections:

a. Indicate connections on shop drawings. For details are not shown comply with the requirements of the AISC.
b. Provide high-strength threaded fasteners for structural steel bolted connections, unless noted otherwise.
c. Combination of bolts and welds in the same connection are not permitted, unless otherwise detailed.
d. Welded Connections:

1) Operators: Welds can be made only by operators who have been previously qualified by tests, as prescribed in AWS D1.1 to perform the type of work required.
2) Welding Equipment: Furnished in sufficient capacity and maintained in good working condition, capable of adjustment in full range of current settings.
3) Do not begin welding until joint elements are clamped in proper alignment and adjusted to dimensions shown on drawings with allowance for any weld shrinkage that is expected. Do not splice members without prior approval.
4) Execute welding in accordance with the reference specifications, with the following modifications and additions:

a) Field Welding: Execute by manual shielded metal-arc welding.
b) Groove Welds: Execute with complete penetration, unless otherwise specified on the drawings.

5) Welding Sequence: Weld heavy sections and those having a high degree of restraint in a sequence with the proper preheat and post-weld heat treatment such that no permanent distortion occurs. Submit a welding sequence for approval for these types of connections.
6) Oxygen Cutting: Execute manual oxygen cutting only with a mechanically guided torch. Alternatively, an unguided torch may be used provided the cut is not within 1/2 inch of the finished dimension and the final removal is completed by chipping or grinding to produce a surface quality equal to that of the base metal edges. Use of oxygen-cut holes for bolted connections or pin connections will under no circumstances be permitted, and violation of this clause will be sufficient cause for the rejection of any pieces in which oxygen-cut holes exist.

3. Tolerances: Comply with AISC "Code of Standard Practice for Steel Buildings and Bridges" unless otherwise indicated. Limit variation in straightness to (member length)/960 measured in any direction for all members.

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4. Finish System: Refer to Division 09 Section “High-Performance Coatings.”

F. Source Quality Control.

1. Testing: Owner will engage an independent testing laboratory to perform testing and inspection of the structural steel and welding. Welds will be tested by visual, dye penetrant, magnetic particle methods, or ultrasonic methods in accordance with instructions from the Installer.

   a. Installer and the testing laboratory inspector will be permitted to inspect the work in the shop or field throughout fabrication and erection.
   b. Testing Inspector’s Responsibilities:
      1) Checking for workmanship of steel, both in the shop and field, and checking general compliance with Contract Documents and steel shop drawings.
      2) Recording types and locations of defects found in the work and measures required and performed to correct such defects.
      3) Submission of inspection reports and test findings to Contractor, Installer, and Architect..
      4) Recording of and submission of reports of defects found with subsequent repair operations.
   c. Steel Fabricator’s Responsibilities:
      1) Making repairs to defective structural steel work to the satisfaction of the inspector and at no additional cost to Owner.
   d. Work of the independent inspector will in no way relieve the steel fabricator of responsibility to comply with requirements of the Contract Documents.

G. Product Handling and Protection: Protect structural steel before, during, and after installation and to protect the installed work and materials of other trades.

H. Rejection and Replacement:

1. In the event of damage to the steel, immediately make repairs and replacements necessary to the approval of and at no additional cost to Owner.
2. Promptly replace materials or welding rejected through inspection either in the shop, mill, or field to the satisfaction of Installer, and at no additional cost to Owner.

I. Qualifications of Steel Fabricator: A company with not less than five (5) years’ continuous experience in the fabrication of structural steel.

2.8 FASTENERS

A. General: Provide fasteners used to secure clamp systems to curbs and cables, assemblage of clamp systems, and other fasteners as required to complete the work specified herein.

B. Materials, General: Comply with the latest edition of referenced ASTM standards and American Iron and Steel Institute (AISI).

1. Fasteners used in membrane clamping systems: Stainless steel.
2. Bolts and Studs: ASTM F593, Type 304.
3. Nuts: ASTM F594, Type 316.
4. Washers: Plain, narrow, complying with AISI Type 18-8.
5. Provide a split-ring lock washer conforming to AISI Type 18-8 for clamping systems subjected to relative movement between clamping and curb.

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6. Other Bolts and Nuts: ASTM A307, zinc plated to conform to ASTM B633 Class Fe/Zn 8 type III, unless otherwise indicated.

2.9 GASKETING

A. Sponge Neoprene Gasketing:

1. Material:

a. Sponge Neoprene: A cellular elastomeric compound of a firm grade, which has been manufactured in pre-formed shapes for use as gasket and sealing material, as specified in ASTM C509.

1) Use cured compounds suitable for use where resistance to sunlight, weathering oxidation, and permanent deformation under load are of prime importance.

B. Dense Neoprene Gasketing:

1. Neoprene: ASTM D2000M hardness Grade 60.

a. Homogeneous material, free from defects.
b. Non-staining formulation consisting of at least 50 percent by weight of basic rubber hydrocarbon. Do not formulate with crude or reclaimed rubber.
c. Physical Characteristics: Meeting or exceeding the following requirements:

PROPERTY	ASTM TEST METHOD	UNITS
Shore A Durometer	D2240	55 – 65
Tensile Strength (Min.)	D412	1,100 PSI
Percent Elongation (Min.)	D412	300%
Percent Compression Set (Max.)	D395, Method B, 22 hrs at 212°F	35%
Heat Aging, Change from Original Properties:	D573, 70 hours @ 212 degrees F	
Hardness Change (Max.)		+15 Points Shore
Tensile Strength (Max.)		-15%
Elongation Change (Max.)		-40%
Flame Resistance		Must Not Propagate Flame
Temperature Range	-30 degrees C to 100 degrees C	
Ozone Resistance	D1171, Method A, 72 hours @ 38 degrees C and 50 mPa Ozone	
Resistance to Oil Aging:	D471, 70 hrs @ 212 degrees F Immersion in ASTM Oil No. 3	
Tensile Strength (Max.)		-70%
Elongation (Max.)		-55%
Volume Change (Max.)		+120%

2.10 MAINTENANCE KIT

A. Architectural Membrane Maintenance Kit: Supply to Owner the following materials for emergency repair or maintenance. Package materials neatly into a maintenance kit for receipt by the Owner.

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QUANTITY	DESCRIPTION
6	12-inch diameter patch with FEP sheets.
12	5-inch diameter patch with FEP sheets.
12	4 inch x 8 inch rectangular patch with FEP sheets.
6 sq yds	Outer Membrane.
6 sq yds	Inner Membrane Liner.
200 ft	FEP tape, 3 inches wide.
1	Soldering iron, 500W with wedge tip.
1	Tacking sealer, 3 inch x 5 inch die.
2	Insulating bearing blocks.
1	5/8 in. hole punch.
1	Utility knife.
50	Repair clips.
1	Spool of No. 36 nylon twine.
36 yds	Cormar B29/4 x 15 Kevlar thread.
1	Hand awl.
1 pkg	C-29 needles.
1	Repair manual.

2.11 FABRICATION OF MEMBRANE PANELS

A. General:

1. Installer’s Responsibilities: Take necessary care to plan and assemble the fabricated sections such that the assembly has no shop patches. Pattern splices, if any, into a symmetrical and repetitive geometric arrangement within the assembly, and where feasible, hidden by structural members.
2. Fabricate joints to have a minimum of 90 percent of the total strength of the coated membrane in strip tensile testing. Fuse structural joints in accordance with industry standards while maintaining the integrity of the coating. Heat-seal PTFE-coated woven fiberglass membranes.
3. Biaxial Test: Test at least one (1) representative sample of the outer membrane. Base membrane compensation in patterning upon the results of the biaxial test loading.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and tensile-membrane system manufacturer's tolerances.

1. Engage land surveyor to perform surveying.

C. Proceed with erection only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

A. Clean and prepare surfaces to be finished with field-applied coatings in accordance with manufacturer's written instructions for each particular substrate condition.

B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION OF MEMBRANE ASSEMBLIES

A. Prior to installation of membrane assemblies, meet with the Installer to review the erection procedure and scheduling.

1. Installer Responsibilities: Coordination of work with other trades.

B. During the system erection period, Owner will field a crew of Owner's maintenance personnel with express purpose to be trained in the use of the repair materials.

C. Prevent other construction trades from having access to, or work from the membrane, unless authorized in writing by Installer.

D. Weather Conditions: Direct Installer to proceed with installation of the tensioned membrane and associated Work only when existing and forecast weather conditions permit Work to be performed in accordance with established procedures and an appropriate degree of safety. Installer will proceed only when willing to guarantee the Work as required without additional reservations or restrictions.

1. Record in writing mutual decisions or agreements to proceed with the Work under unfavorable weather conditions, explicitly stating the reasons for proceeding and the name of the person or persons involved in the decision. Under no condition will the Installer be required to erect in weather conditions not approved by them.

E. Erection of Structural Steel (or other structural supporting elements).

1. Installer's Responsibilities: Employ a competent foreman to supervise steel erection. Ensure foreman is present at all times during execution of Installer's scope of work.
2. Take precautions to ensure an accurately located and completely safe and stable structure.
    a. Use adequate guy cables.
    b. Draw up tight erection bolts.
3. Accurately align steel before permanent connections are made.
4. Leave temporary bracing in place as long as may be required for safety. Locate bracing so it does not interfere with the erection of the tensile membrane structure, and can be removed as required during construction.
    a. Acceptable erection work result is for a structure that is self-supporting and stable after the building is fully completed.
        1) Installer's Sole Responsibility: Determining the erection procedure and sequence and ensuring the safety of the building and its component parts during erection.
            a) This includes the addition of whatever temporary bracing, guys or tie-downs that may be necessary.

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b) Removal of such materials; they will remain Installer's property after completion of the project.

5. Erection Tolerances: As specified in the AISC "Code of Standard Practice for Steel Buildings and Bridges," including those related to placement of anchor bolts, unless otherwise indicated.

   a. Tensile membrane structures (including individual membrane panels) are pre-engineered and pre-fabricated to fit a specific theoretical dimension. For those primary and secondary structural elements to which the membrane structure (including an individual membrane panel) is connected, the erected position of member working points, including those of cantilevered members, must not vary from the theoretical model by more than 1" (25mm) in any direction, either individually, *or cumulatively* across a shipping piece. This includes, but is not limited to, cable connection points, membrane panel edges, membrane bearing locations, intermediate splice points of field-spliced members, hardware connections, weldments, and their anchorages. For arched members, include the three-dimensional location of the member midpoint as a working point for tolerance measurement.
   b. The *Cumulative* Effect of Dimensional Steel Discrepancies: Ensure that the distance between membrane panel support points does not vary more than 1" (25 mm) from the theoretical dimension within each membrane panel.
   c. Steel Structures that Support Tensioned Membrane: Maintain an uninterrupted drainage path and a minimum constant slope of 5 degrees from every point of the membrane.

F. Installation of Tensile Membrane:

1. Install strictly in accordance with manufacturer's written installation instructions and approved shop drawings.
2. Apply adequate prestress to eliminate fabric wrinkles and excess cable sag.

   a. Membranes with extreme twist and/or shallow catenary curves may be more prone to wrinkles.
   b. Minimize wrinkles using proven adjustment methods such that they are not a distraction when viewing the project as a whole.

G. Patching and Repairs:

1. Install canopy fabric with due care and appropriate protection to limit abrasion, cuts and tears.
2. Patch small damaged areas, maximum dimension in any direction 4 in., in the roof fabric.

   a. Patching Limits:

      1) Not more than one field patch in 2000 sq. ft.,
      2) Not more than one field patch per panel.
      3) Not more than 5 field patches in the entire Work.

   b. Execute field patches to achieve 100 percent of the virgin coated membrane's strength properties.
   c. Patches Shape: Circular.

3.4 PROTECTION AND CLEANING

A. Protect work from damage and deterioration during installation.

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B. Installer's Responsibilities:

1. Periodic and final cleaning surfaces of the system's components in conformance with membrane manufacturer's recommendations.
2. Inspection of the system and repairing membrane panels that have become damaged.
    a. Execution of repairs in a visually acceptable manner. Architect will be the sole judge of acceptability of repair

C. Contractor's Responsibilities: Protection of the work and final cleaning, if necessary, until date of Substantial Completion.

END OF SECTION 133100

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SECTION 142123 - MRL TRACTION ELEVATORS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. MRL (Machine room-less) Traction Elevators PE1-PE2 – Office Building

B. MRL (Machine room-less) Traction Elevator SE3 – Office Building

C. MRL (Machine room-less) Traction Elevators PE4-PE5 – Parking Garage

D. The work of this Section includes labor, materials, tools, equipment, appliances, and services required to manufacture, deliver, and install the units complete as shown on the drawings, as specified herein, and/or as required by job conditions.

1.2 CODES

A. Work specified by the Contract Documents shall be performed in compliance with applicable Federal, State, and municipal codes and ordinances in effect at the time of Contract execution. Regulations of the Authority Having Jurisdiction shall be fulfilled by the Contractor and Subcontractors. The entire installation, when completed, shall conform with all applicable regulations set forth in the editions of:

1. Local and/or State laws applicable for the logistical area of project work.
2. 2023 Florida Building Code and all supplements as modified and adopted by the AHJ.
3. Safety Code for Elevators and Escalators, ASME A17.1-2019 and all supplements as modified and adopted by the AHJ.
4. Safety Code for Elevators and Escalators, A17.1S supplement to A17.1 as modified and adopted by the AHJ for Machine Room Less installations (MRL).
5. National Electrical Code (ANSI/NFPA 70).
6. American with Disabilities Act - Accessibility Guidelines for Building and Facilities and/or A117.1 Accessibility as may be applicable to the AHJ.
7. ASME A17.5/CSA-B44.1 - Elevator and escalator electrical equipment.
8. ECC (Energy Conservation Code) as may be applicable to the AHJ.

PART 2 - PRODUCTS

2.1 GENERAL DESCRIPTION

A. Passenger Elevator PE1-PE2 – Office Building

1.	Quantity	Two (2)
2.	Type	Passenger (Designed for Class A Loading)
3.	Capacity (lbs.)	3,500
4.	Speed (fpm)	200 fpm
5.	Travel in Feet	48’-0”
6.	Number of Landings	Four (4)
7.	Number of Openings	Four (4)
8.	Front	Four (4) at 1, 2, 3, 4
9.	Rear	None
13.	Operation	Duplex selective collective
14.	Control	Variable voltage variable frequency
15.	Number of Push Button Risers	One (1)
16.	Clear Inside Cab Dimensions	6’-8” wide x 5’-4” deep (nominal)

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17.	Cab Height	9’-0” overall (~8’-6” under suspended ceiling)
18.	Guide Rails	Steel tees
19.	Buffers	Spring
20.	Cab Included	$30,000 allowance per cab
21.	Car Door Size	3’-6” wide x 8’-0” high
22.	Hoistway Door Size	3’-6” wide x 8’-0” high
23.	Door Operation	Single speed center opening
24.	Fixture and Signals	As further specified
25.	Machine Type	Gearless traction - MRL
26.	Machine Location	Within hoistway overhead
27.	Roping	2:1 or Belted
28.	Power Supply	480V-3PH-60HZ
29.	Counterweight Safety	Not required
30.	Seismic Safety Requirements	Not required

B. Service Elevator SE2 – Office Building

1.	Quantity	One (1)
2.	Type	Service (Designed for Class A Loading)
3.	Capacity (lbs.)	5,000
4.	Speed (fpm)	200 fpm
5.	Travel in Feet	48’-0”
6.	Number of Landings	Four (4)
7.	Number of Openings	Four (4)
8.	Front	Four (4) at 1, 2, 3, 4
9.	Rear	None
13.	Operation	Simplex selective collective
14.	Control	Variable voltage variable frequency
15.	Number of Push Button Risers	One (1)
16.	Clear Inside Cab Dimensions	5’-8” wide x 8’-6 1/2” deep (nominal)
17.	Cab Height	9’-0” overall (~9’-6” under suspended ceiling)
18.	Guide Rails	Steel tees
19.	Buffers	Spring
20.	Cab Included	As further specified
21.	Car Door Size	4’-6” wide x 8’-0” high
22.	Hoistway Door Size	4’-6” wide x 8’-0” high
23.	Door Operation	Two speed side opening
24.	Fixture and Signals	As further specified
25.	Machine Type	Gearless traction - MRL
26.	Machine Location	Within hoistway overhead
27.	Roping	2:1 or belted
29.	Power Supply	480V-3PH-60HZ
33.	Counterweight Safety	Not required
34.	Seismic Safety Requirements	Not required

C. Passenger Elevators PE4-PE5 – Parking Garage

1.	Quantity	Two (2)
2.	Type	Passenger (Designed for Class A Loading)
3.	Capacity (lbs.)	3,500
4.	Speed (fpm)	350 fpm
5.	Travel in Feet	65’-0”
6.	Number of Landings	Seven (7)
7.	Number of Openings	Seven (7)
8.	Front	Seven (7) at G, 2, 3, 4, 5, 6, R

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9.	Rear	None
13.	Operation	Duplex selective collective
14.	Control	Variable voltage variable frequency
15.	Number of Push Button Risers	One (1)
16.	Clear Inside Cab Dimensions	6'-8" wide x 5'-4" deep (nominal)
17.	Cab Height	9'-0" overall (~8'-6" under suspended ceiling)
18.	Guide Rails	Steel tees
19.	Buffers	Spring
20.	Cab Included	As further specified
21.	Car Door Size	3'-6" wide x 8'-0" high
22.	Hoistway Door Size	3'-6" wide x 8'-0" high
23.	Door Operation	Single speed center opening
24.	Fixture and Signals	As further specified
25.	Machine Type	Gearless traction - MRL
26.	Machine Location	Within hoistway overhead
27.	Roping	2:1 or Belted
29.	Power Supply	480V-3PH-60HZ
33.	Counterweight Safety	Not required
34.	Seismic Safety Requirements	Not required

D. Pre-Approved Equipment Manufacturers

1. Otis Elevator
2. TK Elevator
3. Schindler Elevator
4. Kone
5. Mitsubishi
6. Approved Equal

E. In addition to Original Equipment Manufacturers, the following manufacturers' equipment and materials have been pre-approved for use on this project.

1. Other manufacturers/products not specifically mentioned below shall be considered for approval on an individual basis.

    a. Controller - GAL (GALaxy), Motion Control Engineering, Elevator Controls Corporation, Elevator Systems, Inc., Smartrise, Schumacher. (Note, control system must be compatible for plug and play with a Lift-Net Elevator Management System)
    b. Tracks, Hangers, Interlocks and Door Operators - G.A.L., ECI.
    c. Fixtures - G.A.L., Adams, EPCO, Monitor, E-Motive USA, C.E. Electronics, Innovation, MAD, National.
    d. Door Protective Device - Janus, Adams, G.A.L., T.L. Jones, Tri-Tronics.
    e. Cabs and Entrances - CEC Elevator Cab, EDI/ECI, Elite Elevator Cab, Forms + Surfaces, National Cab & Door, Tyler, Velis, Gunderlin, Eklund, EMCO, Columbia Elevator Products, United Cabs, USC Elevator, Retro.
    f. Machines - Hollister-Whitney, Imperial, Torin.
    g. VVVF Power Drives - Mitsubishi, MagneTek, Yaskawa, TorqMax.
    h. Guide Rails - Savera, Monteferro.
    i. Electrical Traveling Cables – Draka, James Monroe.
    j. Roller Guides – ELSCO or approved equal.
    k. Wire Ropes - Paulsen, Bethlehem, Wayland, Draka.
    l. Intercommunications/Telephones – Rath SmartView two-way elevator visual communication system (ASME 2019 Code Compliant) or approved equal.

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2.2 GENERAL EQUIPMENT

A. The machine will be the AC gearless type. Provide all support beams, angles, plates, rails, bearing plates, blocking steel members required to support machine and governor from the overhead structure and/or guide rails.

B. The safety and governor shall be installed to stop the traction elevator in the event of overspeed condition.

C. Hoist ropes or steel belts shall be of the proper size for the capacity and speed and will be properly fitted to the drive sheave.

D. Motor control will be the variable voltage variable frequency drive type. The drive units will be sized electrically to provide the proper power to move the load at the rated speed.

E. Car rails shall be a minimum of 15 pounds/ft. Use a minimum of 3/4" thick fishplates.

2.3 OPERATION

A. Operation shall include the following features:

1. Firemen emergency service.
2. Card reader access provisions for cab card readers including flush Lexan lens, wiring, and mounting provisions.
3. Card reader access provisions for the main lobby floor. Hall card readers must be integrated into the main lobby hall station and include a flush Lexan lens, wiring, and mounting provisions.
4. CCTV provisions.
5. Hoistway access operation / access switches.
6. VVVF regenerative drive.
7. Car top inspection station
8. Emergency power operation

2.4 DOOR OPERATION

A. High speed master door operation equivalent to GAL MOVFR with 3D infrared door protective devices.

2.6 FIXTURES

A. Car Station – PE1-PE2 Office:

1. Swing return car station hinged for service. The swing return shall be dark bronze to match the Architect’s control sample.

B. Car Station – SE3 Office, PE4-PE5 Garage:

1. Separate one-piece faceplate hinged for service. The faceplate shall be stainless steel #4 brushed finish.

C. Hall Call Stations – PE1-PE2 Office (1 duplex riser):

1. Graphite metal finish faceplate to match Architect’s control sample with concealed fasteners.

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2. Tamperproof dark bronze buttons within ADA height requirements.
3. Install Fire Department key switch in main lobby station.
4. Include applicable signage as required by the AHJ.

D. Hall Call Stations – SE3 Office (1 simple riser), PE4-PE5 Garage (1 duplex riser):

1. Graphite metal finish faceplate with tamperproof screws for SE3.
2. Stainless steel #4 brushed finish faceplate with tamperproof screws for PE4-PE5.
3. Tamperproof stainless-steel buttons within ADA height requirements.
4. Install Fire Department key switch in main lobby station.
5. Include applicable signage as required by the AHJ

E. Car Lanterns – PE1-PE2 Office, SE3 Office, PE4-PE5 Garage:

1. For PE1-PE2 Office, graphite metal finish faceplate to match Architect's control sample with concealed fasteners
2. For SE3 Office, graphite metal finish faceplate to match Architect's control sample with concealed fasteners
3. PE4-PE5 Garage, stainless steel #4 brushed finish faceplate with tamperproof screws.
4. Provide one car lantern at each opening.
5. The lantern will have sandblasted solid plexiglass lenses.
6. Provide an electronic chime with adjustable sound control.

F. Hall Position Indicators – PE1-PE2 Office, SE3 Office, PE4-PE5 Garage:

1. For PE1-PE2 Office, graphite metal faceplate to match Architect's control sample with concealed fasteners
2. For SE3 Office, graphite metal faceplate to match Architect's control sample with concealed fasteners
3. PE4-PE5 Garage, stainless steel #4 brushed finish faceplate with tamperproof screws
4. Include LED type 2" high indicators within each fixture.
5. Locate the fixture either above or adjacent to the entrance frames at all floors. Coordinate final location with the Architect.

G. Car Position Indicator – PE1-PE2 Office, SE3 Office, PE4-PE5 Garage:

1. LED type 2" high indicators with direction arrows are integrated within each car station.

H. Emergency Lighting Fixture:

1. For elevators, SE3 Office and PE4-PE5 Garage provide a standard fixture with two lamps and locate the fixture within the car operating panel.
2. For elevators PE1-PE2 Office, arrange the overhead cab lighting to facilitate emergency lighting.
3. The unit will be powered by a trickle charged battery unit for at least four (4) hour illumination.

I. Fixture Attachment, Finish and Design:

1. Faceplates PE1-PE2 Office: Graphite metal finish
2. Faceplates SE3 Office: Graphite metal finish
3. PE4-PE5 Garage: Stainless Steel #4 finish
4. Mount fixtures with concealed fasteners for elevators PE1-PE2 Office.

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5. Mount fixtures with tamperproof screws for elevators SE3 Office and PE4-PE5 Garage. Screws and switches will match the faceplate finish.
6. Design and location of fixtures will meet handicapped requirements.

J. Lobby Control Panel - PE1-PE2 Office, SE3 Office, PE4-PE5 Garage

1. Provide a Lobby Control Panel for all elevators at the Fire Command Center in a location as directed by the Architect.
2. Provide stainless steel #4 finish faceplate with tamperproof screws.
3. The panel shall include:

    a. 2” high LCD car position and travel direction indicators.
    b. Master intercom station / telephone
    c. Three (3) position (on/car to lobby/off) switches
    d. Emergency power controls and indicators as per code requirements
    e. “Car at the designated floor with its doors open” indicator.
    f. System trouble indications

2.7 INTERCOMMUNICATION

A. Provide an intercom in each cab with a master in the Lobby Control Panel and in each control room. Car emergency communications comply with ASME A17.1-2019 Section 2.27.1.

B. Elevator traveling cables will have the following cabling:

1. CCTV – Two (2) Type RG6
2. Card Reader - Six (6) pairs of 20-gauge flexible conductor low voltage cable.

2.8 ENTRANCES

A. Frames and Doors – PE1, PE2, SE3 Office:

1. Provide graphite metal finish entrance frames to match the Architect’s control sample. The frames shall be flush, welded and mitered construction at all floors. Frames shall have a 2" square profile.
2. Provide graphite metal finish doors on all floors.

B. Frames and Doors – PE4-PE5 Garage:

1. Provide stainless steel #4 finish, bolted type frames at all floors. Frames shall have a 2" square profile.
2. Provide stainless steel #4 finish doors on all floors.

C. Sills – PE1-PE2 Office:

1. Nickel silver at all floors

D. Sills – SE3 Office, PE4-PE5 Garage:

1. Aluminum at all floors

E. Car Threshold – PE1-PE2 Office:

1. Nickel silver

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F. Car Threshold – SE3 Office, PE4-PE5 Garage:

1. Aluminum

2.9 CAR ENCLOSURES

A. Parking Garage Elevators PE4-PE5.

1. Wall Panels: 3/4" thick with all surfaces finished in Rigidized 5WL stainless steel. The panels shall be constructed as the removable type.
2. Canopy: Paint canopy with a coat of primer and one coat of low sheen enamel paint.
3. Front Return Panels and Transom: Stainless steel #4 brushed finish.
4. Cab Doors: Stainless steel #4 brushed finish.
5. Ceiling: Suspended 3/4" thick with all surfaces finished in stainless steel #4 brushed finish.
6. Handrails SE3 Office: Two rows of flat 3/8" by 4" stainless steel #4 handrails. Locate handrails on rear and side walls.
7. Handrails PE4-PE5 Garage: One row of flat 3/8" by 4" stainless steel #4 handrails. Locate handrails on rear and side walls
8. Lighting: Fully recessed LED down light fixtures with aluminum alzak reflector.
9. Flooring: Recess the elevator platform to receive finished flooring which will be furnished and installed by others.
10. Provide one set of cab protection pads per elevator.

B. Passenger Elevators PE1, PE2, SE3 Office Building

1. Side Wall Panels: 3/4" thick with all surfaces finished in plastic laminate & metal panels TBD as selected by the Architect. The panels shall be constructed as the removable type.
2. Rear Wall Panel: 3/4" thick with all surfaces finished in plastic laminate & metal panels as selected by the Architect. The panels shall be constructed as the removable type.
3. Canopy: Paint canopy with a coat of primer and one coat of powder coat paint as selected by the Architect.
4. Front Return Panels and Transom: Graphite metal finish to match Architect’s control sample.
5. Cab Doors: Graphite metal finish to match Architect’s control sample.
6. Ceiling: Suspended 3/4" thick with stainless steel #8 mirror finish ceiling panels.
7. Handrail: One row of 1/4" x 2” graphite metal finish handrails. Locate handrails on the rear and side walls.
8. Lighting: LED downlights.
9. Flooring: Recess the elevator platform to receive porcelain finished flooring which will be furnished and installed by others.
10. Provide one set of cab protection pads per elevator.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the elevators, using skilled personnel in strict accordance with the final accepted shop drawings and other submittals.

B. Comply with the applicable codes, manufacturer's instructions, and recommendations.

C. Coordinate work with the work of other trades for proper time and sequence to avoid construction delays and to ensure right-of-way of system. Use lines and levels to ensure dimensional coordination of the work.

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D. Accurately and rigidly secure supporting elements within the shaft ways to the encountered construction within the tolerance established.

E. Erect guide rails plumb and parallel to a maximum of 1/8" (plus or minus 1/16").

F. Install rails so that joints do not interfere with brackets.

G. Set entrance plumb in hoistway and in alignment with guide rails prior to the erection of the front walls.

H. Arrange door tracks and sheaves so that no metal-to-metal contact exists.

I. Reinforce hoistway fascia to allow not more than ½ inch of deflection.

J. Install elevator cab enclosure on platform plumb and align cab entrance with hoistway entrances.

K. Sound isolate the cab enclosure from car structure. Allow no direct rigid connections between enclosure and car structure and between platform and car structure.

L. Isolate cab fan from canopy to minimize vibration and noise.

M. Remove oil, dirt and impurities and give a factory coat of rust inhibitive paint to all exposed surfaces of struts, hanger supports, covers, fascia, toe guards, dust covers and other ferrous metal.

N. Pre-hang traveling cables for at least 24 hours with ends suitably weighted to eliminate twisting.

O. Provide and install motors, switches, controls, safety and maintenance and operating devices in strict accordance with the submitted wiring diagrams and applicable codes and regulations having jurisdiction.

P. After installation touch up, in the field, surfaces of shop primed elements which have become scratched or damaged.

Q. Lubricate operating parts of system as recommended by the manufacturer.

END OF SECTION 142123

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