

Technical Specifications
Volume 1 of 2
100% Construction Documents
ALW Project No. 21414

December 9, 2021

Revised: 1.10.2022 - Addendum #1



North Florida Innovation Labs

Leon County Research & Development Authority



EDA Award No. 04-79-07447

Architect



Architects Lewis + Whitlock
206 W. VIRGINIA STREET
TALLAHASSEE FL 32301
850 942 1718 | think3d.net
FLAA0003316

Consultant Team

Affiliated Engineers, Inc.
Bliss & Nyitray, Inc.
Poole Engineering & Surveying, Inc
RS&H, Inc.
Tullo Planning Group

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TECHNICAL SPECIFICATIONS

VOLUME 1 OF 2

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**Project: Leon County R&D Authority – North Florida Innovation Labs
BNI Project No.: 21T08**

100% Construction Documents

December 9, 2021

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(The sections listed above are provided by Bliss & Nyitray, Inc. (Engineering Business No. 674) for the above referenced Project.)

Bliss & Nyitray Inc.
227 N. Bronough St.
Suite 7300
Tallahassee, FL 32301
Tel. 850-222-4454
Christopher S. Childers, P.E.
Fla. Reg. No. 50812

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**SECTION 011000
SUMMARY**

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: North Florida Innovation Labs
- B. Owner's Name: Leon County Research and Development Authority.
- C. Architect's Name: Architects Lewis + Whitlock, PA.
- D. The project scope includes construction of a new one-story high-tech business incubator, approximately 40,000 GSF in size sited on 3.51 acres located in Innovation Park, Tallahassee, Florida. The project includes site site work, utility connections and a complete building package as described in the 100% Construction Documents.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 005000 - Contracting Forms and Supplements.

1.03 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.04 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.

1.05 WORK SEQUENCE

- A. Coordinate construction schedule and operations with Architect.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 011000

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**SECTION 012300
ALTERNATES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Description of Alternates.

1.02 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement. Both additive and deductive alternates will be accepted in order as listed in each respective grouping.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.03 SCHEDULE OF ALTERNATES

- A. Additive Alternates
1. Roller Shades
 - a. Provide roller shades at all interior window locations indicated in the Finish Schedule (see drawings).
 2. Extended North Porch
 - a. Provide extended north porch as indicated.
 3. Entry Canopy
 - a. Provide foundation, structural steel, roof canopy, finishes and associated lighting.
 4. Hazardous Chemical Storage Building
 - a. Provide hazardous chemical storage building and concrete block screen wall.
- B. Deductive Alternates
1. Remove exhaust fan FEF-2
 - a. Remove redundant lab exhaust fan labeled FEF-2, and variable speed drive labeled VFD-FEF-2. Retain exhaust fan plenum with connection points for the addition of the second fan in the future.
 2. Remove water heater labeled WH-2
 - a. Remove water heater labeled WH-2 and appurtances. Retain power and gas connections, as well as piping tees, terminated with caps and blind flanges to allow for future addition.
 3. Fume hood duct material substitution
 - a. Allow the use of manufacturer fabricated galvanized steel exhaust duct in lieu of welded stainless steel mor main fume exhaust ducts. Branch duct runouts to individual hoods will remain as welded stainless steel.
 4. Remove boiler B-2 and associated equipment
 - a. Remove boiler labeled B-2, heating hot water pump labeled HWP-2, variable speed drive VFD-HWP-2, and appurtances. Retain power and gas connectons., as well as piping tees, terminated with caps and blind flanges to allow for future addition of removed components.
 5. Remove section of 26" fume hood exhaust duct
 - a. Eliminate the horizontal section of 26" round main fume exhaust duct for future hoods on the second floor. Retain a capped duct, terminated on the second floor outside of the shaft, for future connection to fume hoods.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012300

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**SECTION 012500
SUBSTITUTION PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 002113 - Instructions to Bidders: Restrictions on timing of substitution requests.
- B. Section 004325 - Substitution Request Form - During Procurement: Required form for substitution requests made prior to award of contract (During procurement).
- C. Section 006325 - Substitution Request Form - During Construction: Required form for substitution requests made after award of contract (During construction).
- D. Section 012300 - Alternates, for product alternatives affecting this section.
- E. Section 013000 - Administrative Requirements: Submittal procedures, coordination.
- F. Section 016000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.
- B. Substitutions: See General Conditions for definition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
 - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 5. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 - 1. Note explicitly any non-compliant characteristics.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms included in the Project Manual are adequate for this purpose, and must be used.
- D. Limit each request to a single proposed substitution item.

1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Submittal Time Restrictions:
 1. Section 002113 - Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.
 2. Owner will consider requests for substitutions only if submitted at least 10 days prior to the date for receipt of bids.
- B. Submittal Form (before award of contract):
 1. Submit substitution requests by completing the form in Section 004325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):
 1. Submit substitution requests by completing the form in Section 004325. Use only this form; other forms of submission are unacceptable.
- B. Submit request for Substitution for Cause immediately upon discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- C. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
 3. Bear the costs engendered by proposed substitution of:
 - a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
 - b. Other construction by Owner.
 - c. Other unanticipated project considerations.
- D. Substitutions will not be considered under one or more of the following circumstances:
 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 2. Without a separate written request.
 3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.
 1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.

- B. Include completed Substitution Request Forms as part of the Project record.

END OF SECTION 012500

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**SECTION 013000
ADMINISTRATIVE REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electronic document submittal service.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Coordination drawings.
- E. Submittals for review, information, and project closeout.
- F. Number of copies of submittals.
- G. Submittal procedures.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format.
 - 1. This procedure applies to requests for information (RFIs), shop drawings, information submittals, field reports, meeting minutes, and any other document any participant wishes to make part of the project record.
 - 2. It is Contractor's responsibility to submit documents in allowable format.
 - 3. Paper document transmittals will not be reviewed.
 - 4. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

3.02 PRECONSTRUCTION MEETING

- A. Schedule meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor.
- C. Agenda:
 - 1. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 - 2. Designation of personnel representing the parties to Contract, [] and .
 - 3. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum Bi-weekly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
 - 1. Contractor.
 - 2. Owner.
 - 3. Architect.
 - 4. Contractor's superintendent.
- D. Agenda:

1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Maintenance of progress schedule.
 7. Corrective measures to regain projected schedules.
 8. Planned progress during succeeding work period.
 9. Maintenance of quality and work standards.
 10. Effect of proposed changes on progress schedule and coordination.
 11. Other business relating to work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - Closeout Submittals.

3.05 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.06 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
 4. Bonds.
 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.07 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.08 SUBMITTAL PROCEDURES

- A. General Requirements:

END OF SECTION 013000

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**SECTION 014000
QUALITY REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing and inspection agencies and services.
- B. Control of installation.
- C. Mock-ups.
- D. Tolerances.
- E. Manufacturers' field services.
- F. Defect Assessment.

1.02 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants 2008 (Reapproved 2019).
- B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation 2017.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry 2019.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction 2019.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection 2021.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing 2021.

1.03 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Contractor Employed Agency:
 - 1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
 - 2. Laboratory: Authorized to operate in Florida.

PART 3 EXECUTION

2.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

2.02 MOCK-UPS

- A. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be a comparison standard for the remaining Work.
- D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

2.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

2.04 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

- E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

2.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment, and [] as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

2.06 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION 014000

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**SECTION 016000
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Sustainable design-related product requirements.
- C. Re-use of existing products.
- D. Transportation, handling, storage and protection.
- E. Product option requirements.
- F. Substitution limitations.
- G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 012500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- B. Section 013329.02 - Sustainable Design Reporting - LEED v4: Reporting requirements.
- C. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- D. Section 017419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 REFERENCE STANDARDS

- A. C2C (DIR) - C2C Certified Products Registry; Cradle to Cradle Products Innovation Institute Current Edition.
- B. EN 15804 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products 2014.
- C. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action Current Edition.
- D. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action Current Edition.
- E. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures 2006 (Confirmed 2020).
- F. ISO 14040 - Environmental management - Life cycle assessment - Principles and framework 2006 (Amended 2020).
- G. ISO 14044 - Environmental management - Life cycle assessment - Requirements and guidelines 2006 (Amended 2020).
- H. ISO 21930 - Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services 2017.

1.04 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
- D. Sustainable Design Submittals: Items necessary to document use of sustainable construction materials, products, and practices.
 1. See Section 013329.02 for Contractor's reporting necessary for achievement of targeted LEED v4 certification level.

1.05 QUALITY ASSURANCE

- A. Chain-of-Custody (COC): A procedure that tracks a product from the point of harvest or extraction to its end use, including successive stages of processing, transformation, manufacturing, and distribution.
- B. Chain-of-Custody Certificates: Certificates signed by manufacturers and fabricators 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.
- C. Composite Wood and Agrifiber: Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.
- D. Corporate Sustainability Report: A third-party verified report that outlines the environmental impacts of extraction operations and activities associated with the manufacturer's product and the product's supply chain.
- E. Cradle-to-Cradle Certified: End use product certified Cradle-to-Cradle v2 Basic or Cradle-to-Cradle v3 Bronze, minimum, as evidenced by C2C (DIR).
- F. Environmental Product Declaration (EPD): Publicly available, critically reviewed life cycle analysis having at least a cradle-to-gate scope.
 1. Good: Product-specific; compliant with ISO 14044.
 2. Better: Industry-wide, generic; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
 3. Best: Commercial-product-specific; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
 4. Where demonstration of impact reduction below industry average is required, submit both industry-wide and commercial-product-specific declarations; or submit at least 5 declarations for products of the same type by other manufacturers in the same industry.
- G. GreenScreen Chemical Hazard Analysis: Ingredients of 100 parts-per-million or greater evaluated using GreenScreen (METH).
 1. Good: GreenScreen (LIST) evaluation to identify Benchmark 1 hazards; a Health Product Declaration includes this information.
 2. Better: GreenScreen Full Assessment.
 3. Best: GreenScreen Full Assessment by GreenScreen Licensed Profiler.
 4. Acceptable Evidence: GreenScreen report.
- H. Health Product Declarations (HPD): Complete, published declaration with full disclosure of known hazards, prepared using one of the HPDC (HPD-OLT) online tools.
- I. Leadership Extraction Practices: Products that meet at least one of the responsible extraction criteria, which include: extended producer responsibility; bio-based materials; FSC wood products; materials reuse; recycled content; and other programs approved by sustainability certification system used for the project.
- J. Manufacturer's Inventory of Product Content: Publicly available inventory of every ingredient identified by name and Chemical Abstract Service Registration Number (CAS RN).
 1. For ingredients considered a trade secret or intellectual property, the name and CAS RN may be omitted, provided the ingredient's role, amount, and GreenScreen Benchmark are given.

- K. Rapidly Renewable Materials: Made from agricultural products that are typically harvested within a 10-year or shorter cycle.
- L. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 100 miles from the Project site.
- M. Reused Products: Materials and equipment previously used in this or other construction, salvaged and refurbished as specified.
 - 1. Wood fabricated from timber abandoned in transit after harvesting is considered reused, not recycled.
 - 2. Acceptable Evidence: Information about the origin or source, from Contractor or supplier.
- N. Source Location: Location of harvest, extraction, recovery, or manufacture; where information about source location is required to be submitted, give the postal address:
 - 1. In every case, indicate the location of final assembly.
 - 2. For harvested products, indicate location of harvest.
 - 3. For extracted (i.e. mined) products, indicate location of extraction.
 - 4. For recovered products, indicate location of recovery.
 - 5. For products involving multiple manufacturing steps, provide a description of the process at each step, with location.
 - 6. Acceptable Evidence:
 - a. Manufacturer's certification.
 - b. Life cycle analysis (LCA) performed by third-party.
- O. Sustainably Harvested Wood: Solid wood, wood chips, and wood fiber certified or labeled by an organization accredited by one of the following:
 - 1. The Forest Stewardship Council, The Principles for Natural Forest Management; for Canada visit <http://www.fscscanada.org>, for the USA visit <http://www.fscus.org>.
 - 2. Acceptable Evidence: Copies of invoices bearing the certifying organization's certification numbers.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
- B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. All new exterior envelope products must be Florida Product Approved. Provide Notice of Acceptance documentation with submittals.
- C. Use of products having any of the following characteristics is not permitted:
 - 1. Made using or containing CFC's or HCFC's.
 - 2. Made of wood from newly cut old growth timber.
 - 3. Containing lead, cadmium, or asbestos.
- D. Where other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 016116.
 - 2. If wet-applied, have lower VOC content, as defined in Section 016116.
 - 3. Are extracted, harvested, and/or manufactured closer to the location of the project.
 - 4. Have longer documented life span under normal use.
 - 5. Result in less construction waste. See Section 017419
 - 6. Are made of recycled materials.
 - 7. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.

8. If bio-based, other than wood, are or are made of Sustainable Agriculture Network certified products.
9. Are Cradle-to-Cradle Certified.
10. Have a published Environmental Product Declaration (EPD).
11. Have a published Health Product Declaration (HPD).

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 012500 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide off-site storage and protection when site does not permit on-site storage or protection.
- G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

- H. Comply with manufacturer's warranty conditions, if any.
- I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 016000

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**SECTION 016116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for VOC-Content-Restricted products.
- B. Requirement for installer certification that they did not use any non-compliant products.

1.02 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Submittal procedures.

1.03 DEFINITIONS

- A. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
- B. Interior of Building: Anywhere inside the exterior weather barrier.
- C. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- D. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.
- B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings 2005 (Reapproved 2018).
- C. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board 2007.
- D. SCAQMD 1113 - Architectural Coatings 1977 (Amended 2016).
- E. SCAQMD 1168 - Adhesive and Sealant Applications 1989 (Amended 2017).

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.
- C. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of installer's products, or 2) that such products used comply with these requirements.

1.06 QUALITY ASSURANCE

- A. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
 - 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
- B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. VOC-Content-Restricted Products: VOC content not greater than required by the following:
 - 1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
 - 2. Joint Sealants: SCAQMD 1168 Rule.
 - 3. Paints and Coatings: Each color; most stringent of the following:
 - a. 40 CFR 59, Subpart D.
 - b. SCAQMD 1113 Rule.
 - c. CARB (SCM).

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION 016116

**SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Cleaning and protection.
- F. Demonstration and instruction of Owner personnel.
- G. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- H. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 PROJECT CONDITIONS

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- B. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- C. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. Indoors: Limit conduct of especially noisy interior work to the hours of 6 pm to 7 am.
- D. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- E. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.05 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.

- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.

- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2. Remove items indicated on drawings.
 - 3. Relocate items indicated on drawings.
 - 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 - 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. Provide temporary connections as required to maintain existing systems in service.
 - 4. Verify that abandoned services serve only abandoned facilities.
 - 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- D. Protect existing work to remain.

1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
- E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
 2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
 3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
 4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.
- F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- G. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- H. Clean existing systems and equipment.
- I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- J. Do not begin new construction in alterations areas before demolition is complete.
- K. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
 2. Fit products together to integrate with other work.
 3. Provide openings for penetration of mechanical, electrical, and other services.
 4. Match work that has been cut to adjacent work.
 5. Repair areas adjacent to cuts to required condition.
 6. Repair new work damaged by subsequent work.
 7. Remove samples of installed work for testing when requested.
 8. Remove and replace defective and non-complying work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 078400, to full thickness of the penetrated element.
- J. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

3.10 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.11 FINAL CLEANING

- A. Use cleaning materials that are nonhazardous.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and [_____].
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and Owner.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.13 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION 017000

**SECTION 019113
GENERAL COMMISSIONING REQUIREMENTS**

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes the general requirements that apply to the implementation of the commissioning process for this project. Commissioning (Cx) is a quality-oriented process for achieving, verifying, and documenting that the performance of the facilities, systems and assemblies meet defined objectives and criteria.
- B. The commissioning process does not limit the responsibilities of the Contractor or the Design teams to provide a fully functional facility.
- C. Related Sections
 - 1. Division 23 Heating, Ventilation, and Air Conditioning (HVAC)
 - 2. Division 26 Electrical

1.02 REFERENCE

- A. Florida Building Code 2020

1.03 DESCRIPTION

- A. Installations are observed at various stages of construction and systems are functionally tested under various conditions, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, safety modes, power failure, etc.
- B. Components are verified and documented to be installed and responding in accordance with Owner requirements and contract documents.
- C. Functional tests are executed after installation verification checklists and start-ups are complete.
- D. The Commissioning plan describes the commissioning roles and responsibilities for the team. They include:
 - 1. Commissioning Team:
 - a. Participate in the Cx process.
 - b. Attend Cx kick-off meeting and other Cx Team meetings.
 - 2. Cx Authority
 - a. Direct the Cx process
 - b. Provide Cx Plan, Cx Checklist, Functional Performance Tests (FPT), action item list and final Cx report.
 - c. Lead the Cx Team meetings
 - d. Assist with the development of the Cx schedule.
 - e. Perform field visits and document installation
 - 3. Contractor:
 - a. Attend Cx kick-off meeting and other Cx Team meetings
 - b. Include requirements for Cx activities in each subcontract.
 - c. Facilitate coordination of Cx activities.
 - d. Manage Cx communication with sub-contractors.
 - e. Incorporate Cx activities and milestones into master construction schedule. Coordinate with CxA.
 - f. Manage the completion, submission, and review of Checklist and other documentation. Forward completed checklist to CxA at least 10 workdays prior to the scheduled testing date.
 - g. Ensure corrective actions are taken for deficiencies, punchlist, and other identified actionable items.

- h. Document responses and corrective actions for Cx action items and punchlist.
 - i. Provide CxA with required documentation from Cx activities and submittal request.
 - j. Incorporate durations into construction schedule per each system completion to administer FPT.
 - k. Submit detailed training plan to A/E for approval and CxA for comment.
 - l. Schedule, coordinate and assist CxA in seasonal or deferred testing and deficiency corrections required by specifications.
 - m. Provide documentation such as manufacturer and model number, manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings, and details of Owner contracted tests.
 - n. Provide final Balancing Report
4. Sub-contractors:
- a. Attend Cx kick-off meeting and other Cx Team meetings
 - b. Assist with the development of the Cx schedule.
 - c. Complete and sign Cx Checklist in cooperation with the Contractor and submit with supporting documentation. Provide individuals or manufacturer's representatives with specific knowledge of completion of work.
 - d. Ensure installation work is complete, is in compliance with Contract Documents, Checklist are complete and systems are ready for functional testing.
 - e. Provide certified and calibrated instrumentation required to take measurements of system and equipment performance during functional testing.
 - f. Execute inspections, tests, and functional testing as described in contract documents and Cx Plan. Demonstrate and manipulate systems and equipment to show proper operation.
 - g. Provide documents such as trending, calibrations, testing, history, start-up, flushing, installation, etc. as needed for CxA review and documentation.
- E. HVAC systems to be commissioned:
- 1. Air Handling Units
 - 2. Air Terminals
 - 3. Exhaust
 - 4. Building Automation
 - 5. Lab Controls
 - 6. Heating Hot Water
 - 7. Misc. HVAC
- F. Electrical Systems to be commissioned
- 1. Lighting
 - 2. Lighting Control Systems
 - 3. Electrical Metering

1.04 DEFINITIONS

- A. Acceptance Phase – Phase during which system functionality is demonstrated by the installer and documented by the Cx Authority.
- B. Construction Phase – Installation of systems prior to functional testing.
- C. Commissioning (Cx) Process – A quality focused process for enhancing the delivery of a project. The process includes focuses upon verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated and maintained to meet the Owner's Project Requirements.

- D. CxA - Cx Authority is the consultant who facilitates the Cx program and directs and coordinates day-to-day Cx activities. .
- E. Cx Plan - A manual providing documentation of roles and responsibilities and provides structured means of scheduling, coordination and documentation for the Cx process.
- F. Cx Team – The Cx A, Contractor, sub-contractor, and Owner.
- G. Deficiency: Condition of a component, piece of equipment, or system that is not in compliance with Contract Documents.
- H. FPT - Functional Performance Tests documents the dynamic function and operation of equipment and systems.
- I. Issues Log – Items or issued identified by CxA (or other Owner reps) during construction that require contractor response. The primary role of the issues log is to track resolution or closure of deficiencies, recommendations, documentation, etc..
- J. O&M Manual – An Owner focused document for operating and maintaining the commissioned systems throughout the life of the facility. The O&M Manual is intended to be a usable information resource containing all of the information related to the systems, assemblies, and Commissioning Process in one place with indexes and cross references. The O&M manual is organized by “systems” not by specifications and includes design, operation, maintenance parameters, Cx test, etc.
- K. Cx Checklist – (also known as “pre-functional checklist or PFC’s) is the list of items to inspect and elementary component tests that verify proper installation of equipment. The primary purpose of the Cx Checklist is to document static conditions and procedures prior to initial operation (e.g., belt tension, oil levels, labels affixed, gages in place, sensors calibrated, programming complete, etc.). It is a coordinated document representing the efforts of the various installing subcontractors.
- L. Start-up Plan – An organized plan to ensure systems and equipment are started and maintained properly during construction phase activities.
- M. TAB – Test, Adjust and Balance.
- N. Training Plan – a documented, structured approach to Owner training.
- O. Trending: Monitoring and recording controls points of systems as a function of time using building automation system.
- P. Warranty Phase – Post construction. (typically for one year)

1.05 SUBMITTALS

- A. Start up and TAB Plan:
 - 1. Planned delivery dates for major material and equipment, and expected lead times
 - 2. Milestones indicating possible restraints on work by other trades or situations
 - 3. Start dates of individual work items
 - 4. Duration of individual work items
 - 5. Workflow process to start equipment
 - 6. Startup procedures including flushing, filtering, pre-testing, etc.
 - 7. Indoor Air Quality Control
 - 8. Trade coordination required to minimize dust
 - 9. Provide vendor specific start up documentation
 - 10. Coordination of equipment controlled and monitored
 - 11. Temporary controls
 - 12. TAB phasing
- B. Completed Cx Checklist
 - 1. Submit an executed Cx Checklist for each piece of equipment/system to be commissioned.
 - 2. Transmit completed Cx Checklist to the CxA to document request for functional testing to begin.
- C. HVAC O&M Manual

1. Organize manual by systems and submit in original electronic format (scanned documentation is not allowed)
2. Include a table of contents, bookmarks and the following information:
 - a. Maintenance and calibration
 - b. Narrative of operations for each system
 - c. As-built wiring diagrams
 - d. As-built sequence of operations & setpoints
 - e. Scheduling & Programming instructions
 - f. TAB Report
 - g. Final Commissioning Process Report
- D. Training Plan
 1. Organized list of specific equipment or systems that require training
 2. Separate agenda for each training session including but be not limited to:
 - a. Construction Document review of systems
 - b. Installation and as-built conditions
 - c. Theory of operation
 - d. Demonstration of operation
 - e. Operation and Maintenance Document
 - f. Servicing and Maintenance Schedules
 - g. Interlocks and Safeties
 3. Manufactures recommended classroom training and schedule

1.06 QUALITY ASSURANCE

- A. Review the Cx Plan the plan for responsibilities and expectations during the Cx process.
- B. Support the commissioning process to ensure quality installation, operation and maintenance.
- C. During Construction and Acceptance Phase:
 1. Coordinate Cx activities with the Cx Team
 2. Confirm equipment installation and start up is completed prior to functional testing.
 3. Ensure Cx Checklist are completed prior to functional testing
 4. Demonstrate FPT with, and to the satisfaction of CxA.
 5. Manage and correct issues identified by CxA
 6. Performs FPT retests as needed to verify correction of any deficiencies

1.07 SYSTEM STARTUP

- A. Start equipment according to manufactures recommendation.
- B. Document system start up time and date.
- C. Document person(s) performing startup.
- D. Protect equipment from construction dust & debris.

1.08 SCHEDULING

- A. Coordinate and communicate commissioning activities with Owner, and CxA. Commissioning milestones include, but are not limited to:
 1. In-ground infrastructure inspections (i.e. grounding)
 2. Roof on
 3. Permanent power on
 4. Generator testing
 5. Permanent domestic water on
 6. Permanent chilled water on

7. Duct pressure test
 8. Pipe pressure test
 9. HVAC start up
 10. TAB Start
 11. TAB completion
- B. Coordinate and communicate other activities such as inspections, meetings, and schedule changes to the CxA.
- C. Ensure commissioning activities are incorporated into project schedule. Coordinate with CxA.

1.09 WARRANTY

- A. During warranty phase, a review of building performance as well as seasonal testing shall occur. Provide appropriate personnel for opposite seasonal testing and warranty phase inspections.
- B. Repair, replace and correct, to the satisfaction of the Owner, any commissioning action items found during warranty period.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

- A. Provide all specialized tools, test equipment, and instruments required to execute startup, checkout, and FPT of systems and equipment being commissioned.
- B. Test equipment shall be of sufficient quality and accuracy to test and/or measure system performance according to specified tolerances and have calibrated per the respective specifications.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Review commissioning documentation including Cx Plan, Pre-functional Checks, and Functional Performance Test.
- B. Prior to start of any work, check, verify, and coordinate work with Cx Plan, drawings, manufactures recommended installation/start-up, and specifications.
- C. Promptly request clarification and instruction or report any conflicts, inadequate conditions or missing information in the Cx documents.
- D. Respond to action items and field reports as noted by CxA. Provide action taken or solutions to each item.

3.02 FIELD QUALITY CONTROL

- A. Cx Checklist:
1. Complete Cx Checklist to document systems are installed according to contract documents and manufactures recommendations.
 2. Conduct a complete performance test for all systems to assure compliance with the contract documents.
 - a. Any components on systems found defective or not performing satisfactorily shall be readjusted and retested after necessary corrective measures are performed.
 - b. Corrective measures may include modification or addition of equipment and devices, control strategies and/or software program.
 3. Submit Cx Checklist prior to formal demonstration of FPT.
 4. Schedule demonstration of FPT with Cx at least 10 days in advanced.
- B. Repair, reprogram or replace any equipment or work that fails test.
- C. Respond to, and take corrective action on deficiency items or non-conformance issues noted and reported to Cx team as an action list or punch list item. Include:
1. The corrective action taken to remedy issue

2. The date the corrective action was taken
 3. Initials, or name of person responding to the issue
 4. RFI number if applicable
- D. Notify and coordinate with CxA, observation of field test such as duct pressure test, pipe pressure testing, flushing, balancing, etc.

3.03 DEMONSTRATION

- A. Coordinate FPT activities.
- B. Provide competent person (vendor or manufactures representative) to demonstrate functional performance of each system being commissioned.
- C. Utilizing CxA provided FPT, demonstrate to the CxA, the operation of each system being commissioned.
 1. Take actions as needed, to expedite testing and minimize unnecessary delays, while not compromising integrity of procedures.
 2. Post date for completion of resolution of deficiency.
- D. Coordination and Scheduling:
 1. Integrate Cx activities into the project construction schedule. Include milestone deadlines for completion of Cx Checklist and durations for FPT of each system.
 2. CxA will witness and document FPT of systems which as demonstrated by the Contractor or its sub contractor. Designated sub-contractor or vendor responsible for dynamic operation of a system or device shall demonstrate system functionality to CxA.
- E. Manage the resolution of discrepancies, punch-list, action items, etc. identified during the Cx process.

END OF SECTION

SECTION 031000

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes, but is not limited to, the design, engineering, construction and removal of formwork required for cast-in-place concrete as shown on the drawings and specified herein.
- B. Related Sections include, but are not limited to, the following:
 - 1. Section 033000 "Cast-In-Place Concrete" for finishes.
- C. Work Installed and Furnished by Others:
 - 1. Install built-in anchors, inserts, and bolts for connection of other materials; sleeves, thimbles, and dovetail anchor slots, plates, frames, seats and all other embedded items including Owner furnished items.
 - 2. Coating of forms and other surfaces as required by this Section.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Product Data: Submit, for record only, not for approval, data for each type of product and material indicated including others as requested by Architect. Substitutions for specified items or manufacturers are to be submitted in accordance with Section 1 and will be subject to approval, rejection or other appropriate action.
- B. Formwork Shop Drawings: Prepare shop drawings in compliance with ACI 301 and ACI 347R. If requested by the Architect, submit shop drawings showing general construction of forms for concrete permanently exposed to view; including jointing, special form joints or reveals, location and pattern of form tie placement, and other items that visually affect exposed concrete. Architect's review is for general architectural applications and features only. Formwork design for safety, structural adequacy and efficiency is Contractor's responsibility.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For the form-release agent, signed by manufacturer.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work 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.
- B. Delegated Engineer Qualifications: A licensed 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 formwork and shoring and reshoring installations that are similar to those indicated for this Project in material, design, and extent.
- C. Codes and Standards: Comply with the following, unless more stringent provisions are indicated:
 - 1. Florida Building Code, 7th Edition.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 - 3. ACI 301, "Specifications for Structural Concrete."
 - 4. ACI-318, "Building Code Requirements for Structural Concrete and Commentary."
 - 5. ACI 347, "Guide to Formwork for Concrete."
 - 6. ACI SP-4, "Formwork for Concrete."
 - 7. American Forest and Paper Association, "National Design Specifications for Wood Construction."
 - 8. American Plywood Association (APA), "Plywood Design Specification" (Form Y-510); "Concrete Forming: (Form V345)
 - 9. National Institute of Standards and Technology (NIST), "Voluntary Product Standard PS 1-07 for Construction and Industrial Plywood" (Form V995).

1.7 JOB CONDITIONS AND COORDINATION OF TRADES

- A. General: It is the Contractor's sole responsibility to coordinate with all trades for the setting of sleeves, anchor bolts, dovetail slots, inserts, frames, flashing, reglets, pipes, ducts and other embedded items and provide all openings required for installation of other work in accordance with the Contractor's shop drawings and the Contract Documents.
- B. Structural Integrity: Provide no sleeves or openings in structural members unless shown on the structural drawings or approved by the Architect.
- C. Inspection: Architect may inspect formwork at any time and may reject formwork if forms do not conform to the lines, levels, and tolerances as required in this Section, the shop drawings or the Design Drawings. If formwork is rejected, the Contractor must repair or replace the rejected portion with no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. APA Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide paper or fiber tubes of laminated plies with water resistant adhesive and wax impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Stable Soil: In the event stable soil is encountered and straight-line embankments can be maintained, concrete foundations may be placed into accurately excavated earth trenches, free from water, debris, or loose dirt. Excavations shall be minimum 2" wider and longer than specified.

2.2 RELATED MATERIALS

- A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- B. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of the exposed concrete surface.
 2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.
- E. Accessories: Provide necessary anchors, form ties, shores, construction joints, scaffolds, and bracing as required to install forms. Provide construction joints, control joints, expansion joints and waterstops where indicated on the drawings.
1. Form Joint Gasket: Closed cell rubber sponge. Take care that form joints are sealed from leakage of cement paste and moisture.
 2. Material to form drips, reveals, rustification strips or weep holes shall be extruded plastic.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 and ACI 347, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Surface Finish-1.0: ACI 117 Class D, 1 inch for permanently concealed rough-formed finished surfaces.
 - 2. ACI 117 Class C, 1/2 inch: Other rough-formed finished surfaces.
 - 3. Surface Finish-2.0: ACI 117 Class B, 1/4 inch for rough-formed finished surfaces intended to receive plaster.
 - 4. Surface Finish-3.0: ACI 117 Class A, 1/8 inch for smooth-formed finish surfaces exposed to public view.
- D. Construct forms tight enough to prevent loss of concrete mortar.
 - 1. Minimize joints.
 - 2. Exposed Concrete: Symmetrically align joints in forms.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
- F. Do not use rust-stained steel form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- L. Construction and Movement Joints:
 - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.
 - 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 3. Place joints perpendicular to main reinforcement.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

5. Space vertical joints in walls as indicated on Drawings.
 - a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- M. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- N. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- O. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 2. Install dovetail anchor slots in concrete structures as indicated.

3.3 EARTH FORMS

- A. Hand trim sides and bottom of earth forms. Remove loose soil and rocks and compact to specified density prior to placing reinforcing or concrete. Moisten sides and bottom immediately prior to concrete placement. Comply with OSHA's "Trench Safety Act".

3.4 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. The Architect's approval is required for reusing forms for exposed surfaces. Apply new form-release agent.
- C. Reuse forms to greatest extent possible without damaging structural integrity of concrete and without damaging aesthetics of exposed concrete. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

END OF SECTION 033100

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SECTION 032000
CONCRETE REINFORCING

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, but is not limited to, concrete reinforcement bars, welded-wire reinforcing and necessary accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: Submit, for record only, not for approval, data for each type of product and material indicated including others as requested by Architect. Indicate manufacturing process used for steel reinforcing. Substitutions for specified items or manufacturers are to be submitted in accordance with Division 1 and will be subject to approval, rejection or other appropriate action.
- B. Steel Reinforcement Shop Drawings: Complete details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement" and ACI SP-66 "Detailing Manual". Include bar sizes, length, material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports of concrete reinforcement.
 - 1. Do not reproduce Structural Drawings for use as shop or placement drawings without prior approval of the Architect.
- C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
 - 1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4.
- B. Material Certificates: Signed by manufacturers and contractor certifying that the steel reinforcement and reinforcement accessories comply with requirements of the Contract Documents. Unidentifiable steel is prohibited.

- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Steel Reinforcement:
 - a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706.
 - 2. Mechanical splice couplers.

1.5 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the following, unless more stringent provisions are indicated:
 - 1. Florida Building Code, 7th Edition.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 - 3. ACI 301, "Specifications for Structural Concrete."
 - 4. ACI 315, "Details and Detailing of Concrete Reinforcement."
 - 5. ACI-318, "Building Code Requirements for Structural Concrete and Commentary."
 - 6. "CRSI Manual of Standard Practice."
- B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4.
- C. Installer Qualifications: An experienced installer who has completed concrete work 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage and to avoid damaging coatings on steel reinforcement.
 - 1. Deliver reinforcement to the job site bundled, tagged and marked. Use durable metal or embossed plastic tags indicating bar size, lengths, and reference information corresponding to markings shown on placement drawings. Do not store reinforcement in contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A706, deformed.
- C. Headed-Steel Reinforcing Bars: ASTM A970.
- D. Plain-Steel Welded-Wire Reinforcement: ASTM A1064, plain, fabricated from as-drawn steel wire into flat sheets. Rolls are not acceptable.

2.2 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
 - 2. For welded wire fabric in slabs on grade use precast slab bolsters, concrete brick or sand plate chairs spaced no farther than 3'-0" c/c.
- B. Mechanical Splices for Reinforcing Steel: Reinforcing bar splicing system designed to develop minimum 1.25 Fy of the reinforcing bars in both tension and compressions, conforming to ACI 318. Splicing system shall be listed by the International Code Council (ICC). Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the following:
 - 1. Screw-lock bar coupling sleeve system.
 - a. Dayton Superior Bar Lock Coupling System.
 - b. Erico Lenton Lock Mechanical Rebar System.
- C. Reinforcing Dowel Replacement: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the following:
 - 1. Dayton Superior Taper-Lock Form Saver.
 - 2. Erico Lenton Form Saver.
- D. Steel Tie Wire: ASTM A1064, annealed steel, not less than 00508 inch in diameter.

2.3 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
- B. Shop bend and fabricate reinforcing bars to conform with shapes and dimensions indicated on drawings. In case of errors, do not bend or straighten reinforcement without prior approval of Structural Engineer. Make all bends cold.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover specified on the drawings. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1", not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Tie bars and bar supports together with 16-gauge wire and set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
 - 1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 48 bar diameters at splices, or 24 inches, whichever is greater.
 - 2. Stagger splices in accordance with ACI 318.
 - 3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
 - 4. Weld reinforcing bars in accordance with AWS D1.4, where indicated on Drawings.
- G. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging (3'-0" o.c. max.). Lap edges and ends of adjoining sheets at least two mesh spacings. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with 16-gauge wire.
- H. Splices: Locate only where indicated on the drawings or approved shop drawings except with prior approval of Engineer.
 - 1. For standard splices, lap ends, placing bars in contact, and tightly wire tie. See drawings for lap lengths.
 - 2. Install mechanical splicing components in accordance with manufacturer's instructions.
 - 3. Do not weld splices.
- I. Provide template for all column dowels.
- J. Do not bend bars embedded in hardened or partially hardened concrete without approval from the Structural Engineer.
- K. Do not weld reinforcing bars unless specifically shown. Where shown comply with AWS D1.4. Bars to be welded shall conform to ASTM A706.

3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement.
 - 2. Continue reinforcement across construction joints unless otherwise indicated.
 - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

END OF SECTION 032000

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SECTION 033000

CAST-IN-PLACE CONCRETE

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, but is not necessarily limited to, concrete, concrete materials, mix design, placement procedures, curing and finishes.
- B. Related Sections include, but are not necessarily limited to, the following:
 - 1. Section 031000 "Concrete Forming and Accessories".
 - 2. Section 032000 "Concrete Reinforcing."
 - 3. Section 312000 "Earthmoving" for drainage fill under slabs-on-grade, including grade beams and pile caps.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: fly ash, slag cement, other pozzolans, and silica fume.
- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

- A. Product Data: Submit, for record only, not for approval, data for each type of product and material indicated including admixtures, patching compounds, waterstops, joint systems, curing compounds, and others as requested by Architect.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Substantiating data to be no older than one year from date of submittal for each mix design.
 - 1. Indicate amounts of mix water to be withheld for later addition at Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
 - 1. Installer:

- a. ACI Flatwork Technician certifications.
 - b. Written evidence that flatwork placer/finisher has not less than (3) years continuous experience and a minimum of (5) projects in the successful placement and finishing of concrete slabs with flatness and levelness requirements equal to or higher than those specified for this project.
 - c. Written evidence of 10 projects that Installer has completed concrete Work 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.
2. Ready-Mixed Concrete Manufacturer: NRMCA's "Certification of Ready Mixed Concrete Production Facilities".
- B. Material Certificates: Signed by manufacturers and contractor certifying that each of the following items complies with requirements of the Contract Documents:
1. Cementitious materials and aggregates.
 2. Admixtures.
 3. Floor and slab treatments.
 4. Waterstops.
 5. Curing materials.
 6. Bonding agents.
 7. Adhesives.
 8. Vapor retarders.
 9. Repair materials.
 10. Epoxy joint filler.
 11. Joint filler strips.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An qualified installer who has completed concrete Work 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. Installer shall employ on Project personnel qualified as ACI Flatwork Technician and Finisher and a supervisor who is an ACI Concrete Flatwork Technician.
- B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in the successful manufacturing ready-mixed concrete products complying with ASTM C94 requirements for production and delivery, facilities and equipment.
1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's "Certification of Ready Mixed Concrete Production Facilities".
 2. Manufacturer must be F.D.O.T. certified.
- C. Codes and Standards: Comply with the following, unless modified by requirements in the Contract Documents:
1. Florida Building Code, 7th Edition.
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 3. ACI 211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete."
 4. ACI 301, "Specification for Structural Concrete for Buildings."
 5. ACI-304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete."
 6. ACI-305.1, "Guide to Hot Weather Concreting."
 7. ACI-306.1, "Guide to Cold Weather Concreting."

8. ACI-308, "Guide to External Curing of Concrete."
9. ACI-309, "Guide for Consolidation of Concrete."
10. ACI-311.4, "Guide for Concrete Inspection."
11. ACI-318, "Building Code Requirements for Reinforced Concrete."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94 and ACI 301.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless modified by the requirements in the Contract Documents.

2.2 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Products: Subject to compliance with requirements, provide one of the products specified.
 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.3 CONCRETE MATERIALS

- A. Source Limitations:
 1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
 2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
 3. Obtain aggregate from single source.
 4. Obtain each type of admixture from single source from single manufacturer.
- B. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 1. Portland Cement:

- a. ASTM C150, Type I/II
 - b. Slabs on Grade: Type I or Type II with a C3A content less than 8%.
- C. Pozzolans:
1. Fly Ash: ASTM C618, Class **C** or **F**.
- D. Normal-Weight Aggregate: Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Fine Aggregate: Natural quartz sand or manufactured sand from local stone aggregates conforming to ASTM C33, produced from F.D.O.T. approved sources, with fineness modulus not less than 2.4, and having a proven service record.
 2. Coarse Aggregate: Clean, washed, sound, crushed natural stone products produced from F.D.O.T. approved sources. Free from salt, clay, mud, loam or other foreign matter. Conform to ASTM C33; sizes No. 67 (3/4 inch) or No. 57 (1 inch), No. 8 or No. 89 (3/8 inch), and No. 467 (1 1/2 inch). Use largest size practical for members being cast.
 - a. Class: Negligible weathering region, class per ASTM C33. [1N]
- E. Water: Potable and complying with ASTM C94.

2.4 CONCRETE ADMIXTURES

- A. General: Provide admixtures produced by acceptable manufacturers and used in compliance with the manufacturer's printed directions. Use only admixtures which have been incorporated and tested in the accepted mixes, unless otherwise authorized in writing by the Architect. Do not use admixtures which increase the shrinkage properties of concrete. Submit substantiating data, if requested.
- B. Air-Entraining Admixture: ASTM C260.
- C. Water-reducing admixture: Conform to ASTM C494, Type A, D or E free of chlorides, fluorides, or nitrates, except for those attributable to the water used in manufacturing. Use in all structural concrete.
- D. High Range Water Reducing Admixture: Conform to ASTM C494, Type F or Type G and ASTM C1017, Type I or II. Formulate HRWR based on polycarboxylate technology. The admixture is to be added to the concrete mix after initial mixing has taken place. If added at the batch plant HRWR to have an effective life without redosing (third generation HRWR) of at least 2 Hours. If added at the jobsite, the addition shall be by certified technicians employed by the concrete supplier or an authorized representative of the admixture manufacturer. This admixture is in addition to and not a substitute for any other admixtures specified elsewhere.
- E. Calcium Chloride: Do not use calcium chloride in concrete. Do not use any admixtures which contribute free chloride ions to the concrete mix.

2.5 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers for adhesive bonding to concrete.
1. Available Products:

- a. Volclay Waterstop-RX; Colloid Environmental Technologies Co.

2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745: Include manufacturer's recommended adhesive or pressure-sensitive tape.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fortifiber Building Systems Group; Moistop Ultra 10.
 - b. ISI Building Products; Viper VaporCheck II 10mil.
 - c. Raven Industries Inc.; VaporBlock VB10.
 - d. Reef Industries, Inc.; Griffolyn 10 Mil.
 - e. Stego Industries, LLC; Stego Wrap Vapor Barrier (15-Mil)
 - f. W.R. Meadows, Inc.; Perminator 10 mil.

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corporation; MasterKure ER 50.
 - b. Euclid Chemical Company (The); an RPM company; Eucobar.
 - c. Laticrete International, Inc.; L&M E-Con.
 - d. Nox-Crete Products Group; Monofilm.
 - e. SpecChem, LLC; Spec Film.
- B. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, (or Type 2) Class B, dissipating. The film must chemically break down in a 4 to 6 week period after application.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Anti-Hydro International, Inc; A-H Curing Compound #2 DR WB.
 - b. ChemMasters, Inc; Safe-Cure Clear DR.
 - c. Euclid Chemical Company (The) an RPM company; Kurez DR VOX.
 - d. Lambert Corporation; AQUA KURE - CLEAR.
 - e. Laticrete International, Inc.; L&M CURE R.
 - f. TK Products; DC WB Dissipating Cure 2519.
 - g. W.R. Meadows, Inc; 1100-CLEAR.
- C. Liquid Membrane-Forming Cure and Seal Compound: VOC Compliant, conforming to ASTM C309, Type 1, Class B and ASTM C1315, Type 1, Class A or B. The compound shall be a clear styrene acrylate type, 25% solids content minimum, and have test data from an independent testing laboratory indicating to a maximum moisture loss of .040 grams per square cm. When applied at a coverage rate of 200 sq. ft. per gallon.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ChemMasters, Inc; Polyseal WB.
 - b. Euclid Chemical Company (The); an RPM company; Super Diamond Clear VOX.

- c. Kaufman Products, Inc; Krystal 25 Emulsion.
 - d. Lambert Corporation; Crystal Clear Seal 1315 WB.
 - e. Laticrete International, Inc.; L&M Dress & Seal WB 25.
 - f. Metalcrete Industries; Metcure 30.
 - g. Nox-Crete Products Group; Cure & Seal 250E.
 - h. Right Pointe; Right Sheen WB30.
 - i. SpecChem, LLC; Cure & Seal WB 25.
 - j. TK Products; TK-Bright Kure & Seal 1315 VOC.
 - k. Vexcon Chemicals Inc.; StarSeal 1315.
 - l. W.R. Meadows, Inc; Vocomp-30.
- D. Absorptive Cover: AASHTO M182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- E. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- F. Water: Potable or complying with ASTM C1602.

2.8 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.
- B. Bonding Agent: ASTM C1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy-Bonding Adhesive: ASTM C881, two-component, 100% solid, epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements. Use Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.9 CEMENT GROUT AND DRYPACK

- A. Prepackaged Non-Shrink Non-Metallic Non-Gaseous Grout: ASTM C1107, Grade B or C at a fluid consistency (flow cone) of 20 to 30 seconds. Grout shall be bleed free and attain 7500 psi compressive strength in 28 days at fluid consistency. Use for structural repairs.
- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corporation; Masterflow 928.
 - b. Euclid Chemical Company (The) an RPM company; NS Grout.
 - c. Five Star Products, Inc.; Fluid Grout 100.
 - d. Fosroc; Conbextra HF.
 - e. Lambert Corporation; Vibropruf #11.
 - f. Laticrete International, Inc; L&M Crystex.
 - g. Sika Corporation; Sikagrout 212.
- B. Cement Grout: Mix one part Portland cement, 2-1/2 parts fine aggregate, and enough water and liquid bonding agent in a 50/50 mix for required consistency depending on use. Consistency

may range from mortar consistency to a mixture that will flow under its own weight. Use for leveling, preparing setting pads of beds, for filling non-structural voids, and similar uses. Do not use for grouting under bearing plates or structural members in place.

- C. Drypack: Mix one part Portland cement, 2 parts fine aggregate, and enough water and liquid bonding agent in a 50/50 mix to hydrate cement and provide a mixture that can be molded with hands into a stable ball (a stiff mix). Do not mix more than can be used in 30 minutes. Use for patching tie holes and large surface defects in concrete.

2.10 SLAB REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C109.
- B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations. For use on slabs not receiving finishes.
 - 1. Cement Binder: ASTM C150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C109.

2.11 CONCRETE MIXTURES

- A. Concrete for all parts of the concrete work shall be homogenous, and when hardened, possess the required strength, durability, water tightness, appearance, resistance to deterioration and abrasion, and other qualities as specified or required.
- B. Mix proportioning: Proportion concrete according to ACI 211.1. Trial mixes shall be designed by the testing laboratory approved by Architect or designed by the producer and witnessed and tested by the testing laboratory, in accordance with ACI 301 Section 4. Proportioning on the basis of field experience with complete statistical data, not more than one year old from date of submittal and spanning no less than 60 calendar days, to confirm mixes is acceptable.
- C. Provide concrete which will develop ultimate compressive strength at 28 days equal to that noted on drawings and listed below.
- D. Concrete Grades:

Mix No.	Strength	Air Yes/No	Max. Aggregate Size	W/C or W/(C&P)*
1	3500	Y	1"	0.60
2	3500	N	1"	0.60
3	3500	Y	3/8"	0.60
4	4000	Y	1"	0.54
5	4000	N	1"	0.54
6	4000	Y	3/8"	0.52

* Water-Cementitious Ratio: Concrete mixes are required to comply with both the minimum strength and maximum water-cementitious ratios indicated above. Maximum W/C or W/(C&P) is required as an indication of overall concrete quality and may well produce strengths higher than the minimum required.

E. Concrete Use:

Element	Mix No.	Exposure Class*
1. Footings	2	F0
2. Wall Footings	2	P0
3. Slab on Grade	1, 2	S0
4. Columns and Poured Walls	4	F0
5. Elevated Slabs and Beams	5	F0
6. Pumped Elements, Tie Beams, Tie Columns	6	F0
7. Slabs on Steel Deck	5	F0

* Letter in Exposure Category denotes Exposure Class:

F: Freezing and thawing.

S: Sulfate.

P: Requires low permeability.

C: Corrosion protection of reinforcement.

F. Design Slump:

- General: 4 inches.
- Concrete Containing High Range Water Reducer: 2 to 3 inches before addition of HRWR, 8 inches after.
- Slump Tolerance: Plus/minus 1 inch.

G. Chloride Ion Content for Corrosion Protection: Determine the chloride content of the component concrete materials, excluding admixtures, and provide this information to the Architect when submitting mix design. Design mixes will not be approved when the sum of chloride content of component materials indicates that the concrete mix derived from those materials will have a water soluble chloride ion content exceeding 0.1% for concrete exposed to the elements and 0.2% for concrete protected from the elements, when percent is determined by weight of cement. When the source of any component material for the concrete is changed or when the design mix is altered, a chloride content determination test shall be made immediately. Resubmit the altered design mix for approval by the Architect.

H. Cementitious Materials: Minimum Portland cement content of any concrete mix containing slag cement is 280 lbs., for all other concrete mixes, minimum portland cement content is 423 lbs. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

- Provide concrete mixes having a fly ash content of 15% to 20%, by weight, of cementitious material.

- I. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an entrained air content of 3 to 5 percent, except, 1 to 3 percent entrapped air for concrete to receive a hard trowel finish, (floor slabs), unless otherwise indicated.
- O. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in all structural concrete.
 - 2. Use water-reducing and retarding admixture when ambient temperature is 85 degrees F or higher and/or low humidity, or other adverse placement conditions exist.
 - 3. Use high range water-reducing admixture in pumped concrete, walls 8" thick and less, at areas of reinforcing steel congestion, and as required for placement and workability, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.40.
- P. Adjustment to Concrete Mixes: Mix design adjustments may be requested by contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94, and furnish batch ticket information.
- B. Mixing and Delivery Time: When air temperature is between 95 and 100 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 100 degrees F, reduce mixing and delivery time to 60 minutes.
 - 1. Concrete Containing Corrosion Inhibitor: Reduce mixing and delivery time to one hour.
- C. Provide batch ticket for each ready-mixed batch discharged and used in the Work, indicating Project identification name and number, date, mix type and number, batch time, mix time, quantity, and amount of water added and amount of water withheld at the plant. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 VERIFICATION OF CONDITIONS:

- A. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
 - 1. Daily access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
 - 4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor bolts, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges".
 - 2. Install dovetail anchor slots in concrete structures as indicated.
 - 3. Do not provide sleeves or openings in structural members unless shown on the structural drawings or approved by the Architect.

3.4 INSTALLATION OF VAPOR RETARDER

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders in accordance with ASTM E1643 and manufacturer's written instructions. Use below interior floor slabs and as indicated on the Contract Documents.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
 - 2. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 - 3. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Provide dowels as shown on drawings or as required by Architect. Do not continue reinforcement through sides of strip placements of slabs.

2. For members 5" thick or more, form keys from preformed galvanized steel, plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete. Submit detail to Architect for review.
 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs. Allow 4 hours (minimum) between when column or wall is cast and when concrete supported by column or wall is cast.
 5. Space vertical joints in walls at 40 feet o.c. U.O.N. on drawings. Place control joints at 20 feet o.c. between construction joints U.O.N. on drawings. If locations are not shown, locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces. In beams and girders use epoxy-bonding adhesive at locations when fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated on drawings. If requested, the contractor shall prepare and submit to the Architect a joint layout. Construct contraction joints as follows:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades using the "Soff-Cut" early entry dry-cut saws. Cut 1/8 inch wide and 1/4 to 1/3 of slab depth deep joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. This is usually within 2 hours of final finish at each control joint but not more than 8 hours after completion of concrete pour.
 2. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Coordinate construction and control joints with requirements of finish material joints.

3.6 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints at locations indicated, according to manufacturer's written instructions, adhesive bonding or mechanically fastening and firmly pressing into place. Install in longest lengths practicable.

3.7 CONCRETE PLACEMENT

- A. Complete the following before placing concrete:

1. Excavate and compact subgrade, arrange for compaction testing, spray termite treatment on grade, place vapor barrier and remove excess water.
 2. Secure all formwork. Verify that shoring and reshoring has been inspected and accepted by Delegated Engineer. Moisten wood forms except where form coatings are used.
 3. Accurately locate all steel reinforcement, conduits, outlet boxes, anchors, hangers, sleeves, bolts, expansion joint materials and other embedded items and secure against shifting during concrete placement or consolidation.
 4. Accurately locate bearing pads on true, level, and uniform surfaces and secure against shifting during concrete placement.
 5. Cooperate with other trades and verify that their work is installed.
 6. Repair any damage to vapor retarder.
 7. Notify testing agency to test concrete.
 8. Ensure that all required inspections are performed.
- B. Comply with ACI 301, ACI 304, ACI 308 and ACI 318.
- C. Jobsite Tempering: Place concrete within 1-1/2 hours after introduction of water to mix. Submit time stamped batching tickets upon delivery of concrete to job site.
1. Do not add water to ready-mix concrete except as provided in ASTM C94, Paragraph 12.7. When so allowed, limit addition of water to amount withheld at plant as indicated on batch ticket. Water shall be added prior to initial discharge of concrete. No water may be added once concrete placement has started. Addition of water may only be authorized by Architect, the concrete producer's quality control representative, a preapproved representative of Contractor, or the Special Inspector.
 2. Concrete produced with high range water reducer may only be tempered with additional high range water reducer.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
1. Maximum height of concrete free fall is 4 feet. Columns up to **8 [10]** feet in height may be poured in one lift. Concrete in columns and walls over **8 [10]** feet may be poured full height with the use of drop chutes or tremies or up to a maximum of 16 feet if HRWR admix concrete is used.
- E. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
 3. Concrete in columns and walls shall be cast at least twenty-four hours before horizontal members they support are cast. Exception: Concrete in tie columns and grout in masonry cells shall be cast at least four hours before beams or slabs are cast on top of masonry.

- F. Deposit and consolidate concrete for slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using highway bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- G. Pumping: Slumps in excess of six (6) inches at the pump will not be permitted except for concrete produced with HRWR. If placing by means of pump, a specifically designed concrete mix shall be submitted to the Architect for review. No pump lines smaller than 4 inches will be permitted. Exception: A 3" pump line may be used for 8" wide beams and columns cast on top of or between masonry walls or for filling masonry cells.
- H. Cold-Weather Placement: Comply with ACI 306.1 and as follows: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures. Cold weather is defined as a period when, for more than three (3) consecutive days, the average daily air temperature is less than 40 degrees F and the air temperature is not greater than 50 degrees F for more than 1/2 of any 24-hour period. The average daily air temperature is the average of the highest and lowest temperatures occurring during the period from Midnight to Midnight.
1. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F at point of placement.
 2. Provide protected and heated environments for onsite storage of test cylinders.
 3. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 4. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators.
 5. Temporary heat devices shall be operated with special care to protect against concentrations of heat, or direct contact with combustion gases. All surfaces within the enclosure shall be kept wet for curing.
- I. Hot-Weather Placement: Place concrete according to recommendations in ACI 305.1 and as follows, except concrete temperature shall not exceed 100 degrees F:
1. Cool ingredients before mixing to maintain concrete temperature below 100 degrees F at time of placement.
 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
 4. Use Type D water reducing admixtures when ambient temperature exceeds 85 degrees F or other adverse placing conditions exist.
- J. Do not place concrete in exposed conditions when it is raining unless adequate protection is provided.

3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding 1/4" rubbed down or chipped off. Use for concrete surfaces not exposed to view in the finished work.
- B. Smooth-Formed Finish ACI 301 Surface Finish SF-3.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.
 - 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or staining.
 - 2. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished concrete:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 - 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 - 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Wall Surfaces Exposed to Public: Provide elastomeric form liner or steel forms for cast-in-place concrete wall surfaces exposed to the general public.
- E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces. Slope surfaces to drains.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.
- C. Float Finish: Begin floating when bleed water has disappeared and when concrete has stiffened sufficiently to permit operation of power driven floats. Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. When concrete is still plastic, slightly scarify surface with a fine broom.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. Floor Flatness and Levelness: Finish surfaces to the following tolerances according to ASTM E1155 for a randomly trafficked floor surface and measured within 72 hours and before supporting formwork or shoring is removed:
1. Scratch finish or Non-Critical Floors, such as Mechanical Rooms, Non-Public Unfinished Areas, Parking Slabs: Specified overall values of flatness, F_F 20; and levelness, F_L 15; with minimum local values of flatness, F_F 15; and levelness, F_L 10.
 2. Float Finish: Specified overall values of flatness, F_F 25; and levelness, F_L 20; with minimum local values of flatness, F_F 17; and levelness, F_L 15.
 3. Carpeted Slabs: Specified overall values of flatness, F_F 25; and levelness, F_L 20; with minimum local values of flatness, F_F 17; and levelness, F_L 15.
 4. Thin or No Floor Covering: Specified overall values of flatness F_F 35; and levelness, $F(L)$ 25; with minimum local values of flatness, F_F 24; and levelness, F_L 17; for suspended slabs.
 5. Specified overall values of flatness, F_F 45; and levelness, F_L 35; with minimum local values of flatness, F_F 30; and levelness, F_L 24.
 6. Specified Overall Value (SOV): F_F 50; and, F_L 25 with minimum local value (MLV): F_F 40 and F_L 17.

- H. Floor Flatness and Levelness Acceptance: The Architect may authorize the testing agency to verify that the specified F_F and F_L numbers have been achieved for any slab pours except for unshored or sloped construction. F_F and F_L Minimum Local Area is defined as any bay delineated by columns. Slabs that do not meet the specified F_F or F_L numbers shall be removed and replaced. Alternatively, the Contractor may propose repairs to the slab or a credit to the Project.

3.10 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.
- E. Base Plates and Foundations: Use specified non-shrink, non-metallic grout. Where applicable, grout at least 3 days prior to casting concrete on supported structure.

3.11 CONCRETE PROTECTION AND CURING

- A. General: Comply with ACI 308 "Recommended Practice for Curing Concrete" and ACI 301. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305.1 for hot-weather protection during curing.
- B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including slabs, concrete floor toppings, and other surfaces.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Curing Compound: Apply to all concrete surfaces that are not permanently exposed. Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Provide a second coat applied at 90 degrees to initial application within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - 2. Curing and Sealing Compound: Apply to permanently exposed concrete surfaces. Apply uniformly in a continuous operation by power spray or roller according to manufacturer's

- written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.
3. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 4. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project

3.12 TOLERANCES

- A. Conform to ACI 117.

3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. If reinforcing steel is exposed, remove concrete to provide a minimum of 3/4" clearance all around. Prior to patching allow the Architect and Threshold Inspector adequate time to review prepared areas. Clean, dampen with water, and brush-coat prepared surfaces with bonding agent or slurry coat. Fill and compact with dry pack grout or non-shrink non-metallic grout before bonding agent has dried. Fill form-tie voids with cement grout, dry pack grout or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- C. Repairing Unformed Surfaces: Test unformed surfaces, such as slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with dry pack grout or non-shrink non-metallic grout. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- D. Perform structural repairs of concrete, not covered herein, only with Architect's and Structural Engineer's approval, using repair procedures they recommend.
- E. Other repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent testing and inspecting agency, acceptable to the Owner, to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Testing Services: Sample concrete after all water and admixtures have been added. Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day. For slabs 6" or thinner, increase frequency to each 50 cu. yd. or fraction thereof of each concrete mix placed each day.
 2. Slump: ASTM C143; one test at point of placement for each composite sample. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C231, pressure method, for normal-weight concrete; ASTM C173, volumetric method, for structural lightweight concrete; one test for each composite sample.
 4. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40 degrees F and below and when 85 degrees F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C31
 - a. Cast and laboratory cure one set of four standard cylinder specimens for each composite sample. For pumped concrete, take sample at point of placement.
 6. Compressive-Strength Tests of Laboratory Cured Specimens: ASTM C39; test one specimen at 7 days for information and three at 28 days for acceptance. If one of the first two 28-day tests falls below specified strength, test the remaining specimen at 56 days.
- C. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests (3 sets of 2 cylinders each) equals or exceeds specified compressive strength and no compressive-strength test (1 set of 2 cylinders) value falls below specified compressive strength by 10% or 500 psi, whichever is less.
- D. Strength tests that are not satisfactory indicate questionable concrete. The testing agency and Contractor shall submit to the Architect a report of the questionable concrete plus the two test reports immediately prior to and after (5 reports total) for evaluation.
1. If the questionable concrete is not accepted by the Architect, the testing agency shall take core tests per ACI 301 and ASTM C42 minimum diameter of cores is 4 inches. Concrete will be considered structurally adequate if average of 3 cores is at least 85% f'c and no single core is less than 75% f'c.
 2. Concrete not considered adequate by core testing shall be removed and replaced or load tested per ACI 318, Chapter 20.
- E. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for each test.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 or by other methods as directed by Architect.
- G. The contractor may be required to pay all costs of additional testing or evaluation of questionable concrete and provide a credit to the Owner for acceptance of questionable concrete.
- H. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

3.15 PROTECTION

- A. Protect concrete surfaces as follows:
 - 1. Protect from petroleum stains.
 - 2. Diaper hydraulic equipment used over concrete surfaces.
 - 3. Prohibit vehicles from interior concrete slabs.
 - 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
 - 5. Prohibit placement of steel items on concrete surfaces.
 - 6. Prohibit use of acids or acidic detergents over concrete surfaces.
 - 7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

- B. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 033300

**SECTION 033543
POLISHED CONCRETE FINISHING**

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Grinding and honing of the slab surface to receive clear reactive, penetrating liquid hardener/densifier to interior concrete.
 - 2. Application of clear reactive, penetrating liquid hardener.
 - 3. Progressively polishing and burnishing of the slab surface to achieve Finish Requirements.
 - 4. Application of stain resistant surface treatment.
- B. Related Requirements:
 - 1. Section 03 30 00- Cast-in-Place Concrete.

1.02 REFERENCES

- A. American National Standard Institute / National Floor Safety Institute
 - 1. ANSI/NSFI B101.1 Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials.
- B. ASTM International (ASTM):
 - 1. C1028 - Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
 - 2. C1353 - Standard Test Method for Abrasion Resistance of Dimension Stone Subjected to Foot Traffic Using a Rotary Platform, Double-Head Abraser
 - 3. D523- Standard Test Method for Specular Gloss.
 - 4. D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
 - 5. D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - 6. E96/96M Method B (Water Method) - Standard Test Methods for Water Vapor Transmission of Materials.
 - 7. G154 -Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Convene before the start of work on new concrete slabs, patching of existing concrete slabs and start of application of concrete finish system.
 - 1. Require attendance of parties directly affecting work of this Section, including the Owner's Representative, Contractor, Architect, concrete installer, and applicator. Meeting should only convene when required parties are present.
 - 2. Review the following:
 - a. Physical requirements of completed concrete slab and slab finish.
 - b. Locations and time of test areas.
 - c. Protection of surfaces not scheduled for finish application.
 - d. Surface preparation.
 - e. Application procedure.
 - f. Quality control.
 - g. Cleaning.
 - h. Protection of finish system.
 - i. Coordination with other work.

1.04 SUBMITTALS

- A. Product Data:

1. Submit manufacturer's product data sheets and tested physical and performance properties on products to be used for the work.
- B. VOC Certification: Submit certification that products furnished comply with regulations controlling use of volatile organic compounds (VOC).
- C. Certificates:
 1. Certificates by manufacturer stating that installer is listed applicator of special concrete finishes, and has completed the necessary training programs.
- D. Floor Protection Plan.
- E. Mock-up:
 1. Install 4' x 4' mock-up panels of each color demonstrating specified concrete color and finish. Mock-up panels shall be independent and may not be integrated into the final project. Keep approved panels available for comparison throughout the project.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications:
 1. Applicator to be familiar with the specified requirements and the methods needed for proper performance of work of this section. Applicator must have availability of proper equipment to perform work within scope of this project on a timely basis. Applicator should have successfully performed a minimum of 5 projects of similar scope and complexity.
 2. Mock-up: On site, prior to the start of the polished concrete finishing process.
 - a. Require attendance of parties directly affecting work of this Section, including the Contractor, Architect, applicator, and Owner's Representative.
 - b. Notify the above parties one week in advance of date and time when mock-up will be completed.
 - c. Demonstrate the materials, equipment and application methods to be used for work specified herein in pre-approved location approximately 50 sq. ft. in area or as directed by [Architect][Owner's Representative].
 - d. Retain approved mock-up during construction as a standard for judging the completed work. Areas may remain as part of the completed work.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original containers, with seals unbroken, bearing manufacturer labels indicating brand name and directions for storage.
- B. Store concrete hardener/densifier and surface protectant treatment in environment recommended on published manufacturer's product data sheets.
 1. Store containers upright in a cool, dry, well-ventilated place, out of the sun with temperature between 40 and 100 degrees F (4 and 38 degrees C).
 2. Protect from freezing.
 3. Store away from other chemicals and potential sources of contamination.
 4. Keep lights, fire, sparks and heat away from containers.
 5. Do not drop containers or slide across sharp objects.
 6. Do not stack pallets more than three high.
 7. Keep containers tightly closed when not in use.

1.07 FIELD CONDITIONS

- A. Environmental limitations:
 1. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting performance and finishing requirements.
- B. Close areas to traffic during floor application and after application for time period recommended in writing by manufacturer.
- C. Protect the completed slab to prevent damage by the other trades during floor completion.
- D. Temperature Limitations:

1. Apply when surface and air temperature are between 40 degrees F (4 degrees C) and 95 degrees F (35 degrees C) unless otherwise indicated by manufacturer's written instructions.
 2. Apply when surface and air temperatures are expected to remain above 40 degrees F (4 degrees C) for a minimum of 8 hours after application, unless otherwise indicated by manufacturer's written instructions.
- E. Apply when air conditions are calm to minimize surface treatment contacting surface not intended to be finished.
- F. Do not apply to frozen substrate. Allow adequate time for substrate to thaw if freezing conditions exist before application.
- G. Apply a minimum of 24 hours after rain event. Suspend application when rain is anticipated for a period of 8 hours after application, unless otherwise indicated by manufacturer's written instructions.
- H. Temporary Heat: Ambient temperature of 50 degrees F (10 degrees C) minimum.
- I. Ventilation: Provide adequate ventilation in confined or enclosed areas in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Substitutions: Products listed in this section are to be considered the basis of design. Equal products from other manufacturers can be submitted to the architect for evaluation prior to the bid date.

2.02 MATERIALS

- A. Color Additives:
1. Non-stained concrete: natural concrete, no color additives.
- B. Penetrating Concrete Hardener/Densifier: Lithium silicate hardener/densifier.
1. Basis of Design: Consolideck LS, manufactured by PROSOCO, Inc., Lawrence, KS, (800) 255-4255, www.prosoco.com.
 2. Subject to compliance with the following requirements:
 - a. Comply with national, state and district AIM VOC regulations and contain 50 g/L or less.
 - b. Registered as an approved NSF International/Nonfood Compound Registration.
 - c. Abrasion Resistance: Greater than 50 percent improvement over untreated samples when tested in accordance with ASTM C1353.
 - d. Achieve 'High Traction Range' readings when tested in accordance with ANSI B101.1.
 - e. Coefficient of Friction: Greater than 0.60 dry, Greater than 0.60 wet when tested in accordance with ASTM C1028.
 - f. Adhesion: Greater than 10 percent increase in pull-off strength when compared to an untreated sample when tested in accordance with ASTM D4541.
 - g. Water Vapor Transmission: 100 percent retained when compared to untreated samples when tested in accordance with ASTM E96/96M Method B (Water Method).
 - h. UV Stability: No degradation or yellowing of material when tested in accordance with ASTM G154.
- C. Interior Concrete Protective Treatments:
1. General Purpose high-gloss film forming premium sealer, lithium silicate hardener/densifier.
 - a. Product: Consolideck LSGuard, manufactured by PROSOCO, Inc., Lawrence, KS, (800) 255-4255, www.prosoco.com.
 - b. Subject to compliance with the following requirements:
 - 1) Comply with national, state and district AIM VOC regulations.

- 2) Registered as an approved NSF International/Nonfood Compound Registration.
- 3) Achieve 'High Traction Range' readings when tested in accordance with ANSI B101.1.
- 4) Coefficient of Friction: Greater than 0.60 dry, greater than 0.60 wet when tested in accordance with ASTM C1028.
- 5) Adhesion: : Greater than 10 percent increase in pull-off strength when compared to an untreated sample when tested in accordance with ASTM D4541.
- 6) UV Stability: No degradation or yellowing of material when tested in accordance with ASTM G154.

2.03 EQUIPMENT

- A. Auto Scrubber Machine: For cleaning operations.
- B. Hand Grinder or stand-up edger for edge grinding/polishing.
- C. Grinding/Polishing Equipment:
 1. Dry grinding/polishing machines shall include a dust extraction system, including HEPA filtration vacuum.
- D. Diamond Segments:
 1. Use heads from the same manufacturers throughout the entirety of the project.
- E. Diamond Heads Types:
 1. Metal Diamonds: 80 or 150.
 2. Hybrid Style Diamonds: 50 or 100.
 3. Resin Bonded, Phenolic Diamonds: 100, 200, 400, 800, 1500, and 3000 (if necessary).
- F. Burnishing Machine and Burnishing Pads to produce specified results.
 1. Burnishing Machine: High speed burnisher, generating pad speeds of 1,500 RPM or higher, as recommended by protective treatment manufacturer. Dust skirt must be installed at time of work.
 2. Burnishing Pads: as recommended by protective treatment manufacturer.
 - a. White Burnishing Pad, non-abrasive.
 - b. Consolideck Heat Pad manufactured by PROSOCO, Inc., Lawrence, KS, (800) 255-4255, www.prosoco.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrate with installer present for conditions affecting performance of finish. Correct conditions detrimental to timely and proper work. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.
- B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.02 PREPARATION

- A. Cure time: concrete slabs scheduled for polished concrete finish shall be watered to maintain maximum moisture content for 7 days after initial concrete pour.
- B. Application: concrete polishing shall be completed prior to partition placement.
- C. Take all necessary precautions to protect adjacent spaces on the same floor and below from any negative effects that may result from concrete grinding, honing, or finishing process.
- D. Clean dirt, dust, oil, grease and other contaminants that interfere with penetration or performance of specified product from surfaces. Use appropriate concrete cleaners approved by the concrete surface treatment manufacturer where necessary. Rinse thoroughly using pressure water spray to remove cleaner residues. Allow surfaces to dry completely before application of product.

- E. Repair, patch and fill cracks, voids, defects and damaged areas in surface as approved by the Architect. Allow repair materials to cure completely before application of product.
- F. All holes in concrete floor in areas to receive polished concrete floor finish to be patched be filled by polished concrete subcontractor to provide for correct patch material to result in uniform color and finish.
- G. Variations in substrate texture and color will affect final appearance and should be corrected prior to application of sealer/hardener system and the polishing steps.
- H. Protect surrounding areas prior to application. If product is accidentally misapplied to adjacent surfaces, flush with water immediately before material dries.
- I. Avoid contact in areas not to be treated. Avoid contact with metal, glass and painted surfaces.
- J. Seal open joints in accordance with Section 07 90 00.
- K. Apply specified sealants and caulking and allow complete curing before application of penetrating concrete hardener/densifier.
- L. Do not proceed until unsatisfactory conditions have been corrected.

3.03 CONCRETE GRINDING, HONING, AND POLISHING

- A. Adhere to industry standard grinding, honing, and polishing procedures for dry and wet grinding and honing.
- B. Scrub and rinse slab surface with clean water and vacuum with auto-scrubber between and after final passes.
- C. Sequential progression of diamond tooling steps shall be required and limited to no more than double the grit value of the previous diamonds used.
- D. Overlap adjacent passes by 25 percent.
- E. Perform each pass perpendicular to the other pass north/south then east/west; multiple passes may be needed.
- F. Progressively grind, hone and polish the slab surface utilizing approved diamond segments as necessary to produce Finishing requirements.
 - 1. Apply liquid concrete repair material to fill gaps, voids and pop-outs during grinding operation per manufacturer's published recommendations.

3.04 APPLICATION OF PENETRATING CONCRETE HARDENER/DENSIFIER

- A. Apply hardener/densifier at the rate of 500 to 700 square feet per gallon with a low pressure sprayer fitted with a 0.5 gpm spray tip. (Typically after 200-grit and no later than 400 grit).
- B. Apply sufficient material to keep concrete surface wet for 5 to 10 minute period, without producing puddles.
- C. Allow treated surface to dry.
- D. Continue progressively polishing floor with required resin diamonds as necessary to produce desired final finish.

3.05 APPLICATION OF INTERIOR CONCRETE PROTECTIVE TREATMENT

- A. Application of general purpose, high gloss protective treatment:
 - 1. Apply per manufacturer's published recommendations to clean, dry slab at the completion of mechanically polishing the slab surface.
 - 2. Lightly wet a clean microfiber pad with protective treatment and wring out excess, leaving the pad damp.
 - 3. Working from one control joint to another, apply a light, fine spray of protective treatment to a small section of the floor using a clean, pump-up sprayer fitted with a 0.5 gpm spray tip, at an estimated coverage rate of 2000 to 3000 square feet per gallon.
 - 4. Using the damp microfiber pad and firm downward pressure, immediately spread the protective treatment to produce a thin, even coating. Spread the product as far as possible

while maintaining a wet edge. Properly applied, protective treatment dries quickly. Stop spreading once drying begins. Avoid overlapping.

5. Allow to dry tack free, typically 20 to 60 minutes.
6. Once dry, high- speed burnish slab surface fitted with manufacturer recommended burnishing pad to increase gloss and to help the treatment fuse and bond with the concrete for increased durability and longevity. Surface temperatures immediately behind the burnisher must achieve 90.5 degrees Fahrenheit. (Burnish between coats if multiple applications are desired.)
7. Repeat above steps 1 through 6, as necessary for additional applications of protective treatment, to achieve desired final finish (Maximum 3 coats).
8. Retain paragraph below if a general purpose, medium gloss protective treatment is required.

3.06 SLAB PROTECTION

- A. Protect finished floors to prevent damage including staining, gouges and scratching by construction traffic and activities until possession.
- B. Do not drag or drop equipment or material across the slab which will scratch or chip it.
- C. Inspect tires for debris prior to use on slab. Remove embedded items which may cause damage to floor slab.
- D. Clean up spills on slab immediately. Provide cleaning chemicals and absorptive materials.
- E. Develop a concrete protection procedure which addresses the following procedures:
 1. Communication of protection plan to subcontractors and vendors.
 2. Procedures for cleaning up slab spills, including use of and availability of cleaning chemicals and absorptive materials at Site.
- F. Provide a clean slab surface using concrete maintenance cleaner within an auto scrubber, equipped with soft nylon brushes, in accordance with manufacturer's published recommendations.

3.07 FINISHING REQUIREMENTS

- A. Appearance:
 1. Interior exposed finished slab areas must consist of the following:
 - a. Slab surface must meet the desired sheen, as discussed in Pre-Installation meeting and be consistent with approved Mock-up.
 - b. Slab surface must have a consistent look and exhibit a finish that has no evidence of streaking or burnish marks.
 - c. White residue or hazy appearance is not acceptable.
 - d. Exposure of aggregate beyond CPAA B-Fine Aggregate is not acceptable.
 - e. Interior exposed finished slab areas must consist of the following CPAA Gloss Level:
 - 1) Finished Gloss Level 3 - Semi-Polished Gloss Appearance.

END OF SECTION 033543

**SECTION 034500
PRECAST ARCHITECTURAL CONCRETE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Architectural precast concrete sills.
- B. Supports, anchors, and attachments.
- C. Grouting under panels.

1.02 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete 2019, with Errata (2021).
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.
- E. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts 2021a.
- F. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric) 2021a.
- G. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2020.
- H. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars 2019.
- I. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2012.
- J. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.
- K. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete 2020.
- L. ASTM C150/C150M - Standard Specification for Portland Cement 2021.
- M. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).
- N. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete 2017a.
- O. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete 2019.
- P. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete 2016.
- Q. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars 2018a.
- R. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures 2020.
- S. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars 2021.
- T. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.
- U. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel 2018.
- V. PCI MNL-117 - Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products 2013.
- W. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete 2017.
- X. PCI MNL-122 - Architectural Precast Concrete 2007.
- Y. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete 1988.

- Z. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction 2000.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's information on accessory products, including pigments, admixtures, inserts, plates, etc.
- C. Shop Drawings: Indicate layout, unit locations, configuration, unit identification marks, reinforcement, connection details, support items, location of lifting devices, dimensions, openings, and relationship to adjacent materials. Provide erection drawings.
 - 1. Include details of mix designs.
- D. Samples: Submit two samples, 6x6 inch in size, illustrating surface finish, color and texture.
- E. Fabricator's Qualification Statement: Provide documentation showing precast concrete fabricator is accredited under IAS AC157.

1.05 QUALITY ASSURANCE

- A. Design Engineer Qualifications: Design precast concrete units under direct supervision of a Professional Structural Engineer experienced in design of precast concrete and licensed in Florida.
- B. Fabricator Qualifications:
 - 1. Firm having at least 5 years of documented experience in production of precast concrete of the type required.
 - 2. Plant certified under Precast/Prestressed Concrete Institute Plant Certification Program; product group and category A1 - Architectural Precast Concrete.
- C. Welder Qualifications: Qualified within previous 12 months in accordance with AWS D1.1/D1.1M and AWS D1.4/D1.4M.
- D. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.06 MOCK-UP

- A. Provide mock-up of each item to be installed.
- B. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handling: Lift and support precast units only from support points.
- B. Protect units to prevent staining, chipping, or spalling of concrete.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Architectural Precast Concrete:
 - 1. Any manufacturer holding a PCI Group A Plant Certification for the types of products specified; see www.pci.org/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 PRECAST UNITS, GENERAL

- A. Precast Architectural Concrete Units: Comply with PCI MNL-120, PCI MNL-122, PCI MNL-123, PCI MNL-135, and ACI 318.
 - 1. Design Loads: Static loads, anticipated dynamic loading, including positive and negative wind loads, thermal movement loads, and erection forces as defined by applicable code.
 - 2. Calculate structural properties of units in accordance with ACI 318.
 - 3. Accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

4. Provide connections that accommodate building movement and thermal movement and adjust to misalignment of structure without unit distortion or damage.

2.03 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi).
 1. Epoxy coated in accordance with ASTM A775/A775M.

2.04 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
- B. Other Cementitious Materials:
 1. Fly Ash or Natural Pozzolans: Comply with ASTM C618.
 2. Ground Granulated Blast Furnace Slag: ASTM C989/C989M.
 3. Silica Fume: Comply with ASTM C1240.
- C. Fine and Coarse Structural Aggregates: ASTM C33/C33M.
- D. Lightweight Structural Aggregate: ASTM C330/C330M.
- E. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
 1. Color(s): As selected by Architect from manufacturer's full range.
- F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.
- G. Air Entrainment Admixture: ASTM C260/C260M.
- H. Grout:
 1. Non-shrink, non-metallic, minimum 10,000 psi, 28 day strength.

2.05 SUPPORT DEVICES

- A. Connecting and Support Devices; Anchors and Inserts: ASTM A36/A36M steel; hot-dip galvanized in accordance with ASTM A153/A153M.
 1. Clean surfaces of rust, scale, grease, and foreign matter.
- B. Bolts, Nuts, and Washers: ASTM A307 heavy hex bolts, Type A, hot-dip galvanized, with matching ASTM A563 (ASTM A563M) nuts and matching washers.

2.06 FABRICATION

- A. Fabricate in compliance with PCI MNL-117 and PCI MNL-135.
- B. Fabricate and handle epoxy-coated reinforcing bars in accordance with ASTM D3963/D3963M.
- C. Use rigid molds, constructed to maintain precast unit uniform in shape, size, and finish.
- D. Maintain consistent quality during manufacture.
- E. Fabricate connecting devices, plates, angles, items fit to steel framing members, inserts, bolts, and accessories. Fabricate to permit initial placement and final attachment.
- F. Embed reinforcing steel, anchors, inserts plates, angles, and other cast-in items.
- G. Place recessed flashing reglets continuous and straight.
- H. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.

2.07 FABRICATION TOLERANCES

- A. Comply with PCI MNL-117 and PCI MNL-135, except as specifically amended below.
 1. Maximum Variation From Nominal Face Dimensions: Plus or minus 3/32 in.
 2. Maximum Variation From Square or Designated Skew: Plus or minus 1/8 inch in 10 feet.
 3. Maximum Variation from Thickness: Plus or minus 1/8 in.
 4. Maximum Bowing of Members: Plus or minus length/360.

2.08 SOURCE QUALITY CONTROL

- A. Provide testing and analysis of concrete mix.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building structure, anchors, devices, and openings are ready to receive work of this section.

3.02 PREPARATION

- A. Provide for erection procedures and induced loads during erection. Maintain temporary bracing in place until final support is provided.

3.03 ERECTION

- A. Erect units without damage to shape or finish. Replace or repair damaged panels.
- B. Erect units level and plumb within allowable tolerances.
- C. Align and maintain uniform horizontal and vertical joints as erection progresses.
- D. Weld units in place. Perform welding in accordance with AWS D1.1/D1.1M.
- E. Provide non-combustible shields during welding operations.
- F. Touch-up field welds and scratched or damaged primed painted or galvanized surfaces.
- G. Exposed Joint Dimension: 1/2 inch. Adjust units so that joint dimensions are within tolerances.

3.04 TOLERANCES

- A. Erect members level and plumb within allowable tolerances. Comply with PCI MNL-135, except as specifically amended below.
 - 1. Plan Location from Building Grid Datum: Plus or minus 3/8 in.
 - 2. Top Elevation from Nominal Top Elevation: Plus or minus 3/8 inch.
 - 3. Exposed Joint Dimension: Plus or minus 3/16 inch.
 - 4. Maximum Jog in Alignment of Matching Faces or Edges: Plus or minus 3/16 inch.
 - 5. Differential Bowing or Camber as Erected Between Similar Adjacent Members: Plus or minus 3/16 inch.

END OF SECTION 034500

SECTION 042900

REINFORCED UNIT MASONRY

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 grouted, reinforced masonry consisting of grout and reinforcing steel.
- B. Related Sections:
 - 1. Section 032000 "Concrete Reinforcement" for reinforcing steel.
 - 2. Section 033000 "Cast-In-Place Concrete" for concrete.
 - 3. Section 042000 "Unit Masonry" for all other elements of masonry construction.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Unit Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE AND PRECONSTRUCTION TESTING REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28-days. Contractor shall determine the net-area compressive strength of masonry based on 1.4B or 1.4C. Mortar for unit masonry shall comply with ASTM C270. Contractor shall meet ASTM C270 requirements based on the Property or Performance Specification.
- B. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
 - 1. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
 - a. Concrete Masonry Unit Test (Property and Proportion Specification): For each type of unit required, according to ASTM C140 for compressive strength.
 - b. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
 - c. Mortar Test (Property Specification): For each mix required, according to ASTM C109 for compressive strength.

- d. Mortar Test (Property Specification): For each mix required, according to ASTM C780 for compressive strength.
- e. Grout Test (Compressive Strength) (Property and Performance Specification): For each mix required, according to ASTM C1019.

1.5 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.
 - 2. Reinforcing Steel: Show fabrication and installation details Reinforcing Steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show bar sizes, schedules, bent bar diagrams and other arrangements as required for fabrication and placement. Show elevations of reinforced walls.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
 - 1. Grout mixes complying with material and compressive strength requirements of ASTM C476 for fine grout. Include description of type and proportions of grout ingredients and design slump.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency
- B. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements
 - b. Include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include brand, type, and name of manufacturer.
 - 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 4. Grout mixes. Include description of type and proportions of ingredients
 - 5. Reinforcing bars.
 - 6. Joint reinforcement.
 - 7. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Test according to ASTM C109 for compressive strength, ASTM C1506 for water retention, and ASTM C91 for air content.

2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirements.
- 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 ACI 530.1/ASCE 6/TMS 602.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C1093 for testing indicated.
- B. Masonry Standard: Comply with the Florida Building Code, 7th Edition and ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Refer to Section 042000 "Unit Masonry" for masonry materials and accessories and grout materials not included in this section.

2.2 MANUFACTURERS

- 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 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.

2.3 CONCRETE MASONRY UNITS

- A. CMUs: ASTM C90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2,000 psi.
 - 2. Density Classification: Normal weight.
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces, matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for corners, jambs, sashes, control joints, lintels, bond beams and other special conditions.

2.4 CONCRETE AND MASONRY LINTELS

A. General: Provide one of the following:

1. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by the same method used for concrete masonry units.
2. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with fine grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Mortar Cement: ASTM C1329.
- E. Aggregate for Mortar: ASTM C144
- F. Aggregate for Grout: ASTM C404 for fine grout.
- G. Water: Potable.

2.6 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615, Grade 60. Shop fabricate bent bars.
- B. Masonry Joint Reinforcement, General: ASTM A 951.
1. Interior Walls: Mill- galvanized, carbon steel.
 2. Exterior Walls: Hot-dip galvanized, carbon, ASTM A 153 with a coating thickness of 1.50 oz/sf steel.
 3. Wire Size for Side Rods: 0.148-inch diameter.
 4. Wire Size for Cross Rods: 0.148-inch diameter.
 5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods complying with ASTM A951.
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication.
 - 1. Provide units with either two loops or four loops as needed for number of bars indicated.

2.7 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.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site
- C. Mortar for Unit Masonry: Comply with ASTM C270 Proportion or Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 - 1. For masonry retaining earth, use Type M.
 - 2. For all other masonry, use Type S.
- D. Grout for Unit Masonry: Comply with ASTM C476 with a minimum compressive strength of 3000 psi in 28 days.
 - 1. Use fine grout with a slump of 8 to 10 inches as measured according to ASTM C143.

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.
 - 1. Verify that foundations are within tolerances specified.
 - 2. Verify that reinforcing dowels are properly placed.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Refer to Section 042000 "Unit Masonry" for general installation requirements of unit masonry.
- B. Build chases and recesses to accommodate items specified in this and other Sections.

- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units which are not in multiples of 8 inches. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Allow wet masonry units to dry prior to placement.

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 or minus 1/4 inch.
- 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
- 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch 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, or 1/2-inch 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, 1/4 inch in 20 feet, or 1/2-inch maximum.
- 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch 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, 1/4 inch in 20 feet, or 1/2-inch maximum.
- 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
- 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
- 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:

- 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
- 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
- 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
- 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

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, reinforcement, 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: Unless otherwise indicated, lay masonry in one-half running bond with vertical joint in each course centered on units in courses above and below, unless otherwise indicated on Drawings. Interlock each course at corners.
- C. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- D. Place clean units while the mortar is soft and plastic. Remove and relay in fresh mortar any unit disturbed to the extent that initial bond is broken after initial positioning.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- G. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- H. Design, provide and install bracing that will assure stability of masonry during construction. Include provisions to project against wind or other natural or construction forces that might collapse or otherwise damage a partially or completely built masonry wall in a partially completed structure.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry units as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

3.6 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.

2. Space reinforcement not more than 8 inches o.c. in foundation walls.
 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections.
- D. 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 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 16 inches o.c. or as indicated on the drawings.

3.8 ANCHORING MASONRY TO CONCRETE

- A. Anchor masonry to concrete where masonry abuts or faces concrete to comply with the following:
1. Provide an open space not less than 3/8 inch wide between masonry and 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 at 16 inches o.c. vertically and 36 inches.

3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows:
1. Install backer-rod in head joints and apply sealant after concrete masonry is complete.

3.10 LINTELS

- A. Provide concrete or masonry lintels where shown and where openings of more than 24 inches are shown. Reinforce and grout lintels as shown on the Drawings.

- B. Install steel lintels where indicated.
- C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.11 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
 - 1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 and as follows:
 - 1. Place reinforcement and accessories as indicated.
 - 2. Support and fasten reinforcement together to prevent displacement by construction loads or by placement of grout.
 - 3. Clean reinforcement by removing mud, oil, or other materials that will reduce the bond at the time grout is placed. Reinforcement with tightly bound rust and/or mill scale is acceptable without cleaning provided the dimensions and weights, including heights of deformations, of the cleaned sample are not reduced.
 - 4. Place all reinforcement prior to grouting. Tie vertical reinforcement to dowels at base of masonry with tie wire and thread masonry units over or around reinforcement. Support vertical reinforcement at 10 feet o.c. Extend vertical bars the specified lap length above top of pour and support bar in proper position at top of grout pour. Where vertical bars are placed after laying masonry, place wire loops extending into cells as masonry is laid and loosen before mortar sets. After insertion of bar, pull loops and bar to proper position and tie free ends.
 - 5. Do not bend reinforcement after it is embedded in grout.
 - 6. Splice bars only where indicated. Provide 48 bar diameter lap splices, unless otherwise noted. Place bars in contact and wire tie. Bars spliced by noncontact lap splices shall be spaced 6 inches apart (maximum).
 - 7. Bar placement tolerance is $\pm 1/2$ inches perpendicular to wall and 2 inches along wall. The clear distance between parallel bars that are not contact lap spliced shall be not less than 1 inch in walls and 1-1/2 inches in columns and pilasters. Maintain $1/4$ inch clear between bars and any face of masonry.
- C. Laying Masonry Walls: Construct masonry walls as follows:
 - 1. Lay masonry units to top of grout pour prior to placing grout. Maximum grout pour height is 12 feet or top of bond beam, whichever is lower.
 - 2. Construct wall such that vertical cells to be grouted are aligned and unobstructed openings for grout are 3 inches x 4 inches (minimum). Construct grout spaces free of mortar droppings, debris, loose aggregates, and any material deleterious to grout; or, clean the cells prior to grouting. Remove masonry protrusions extending 1/2 inch or more into cells to be grouted.
 - 3. Do not lay masonry until grouted masonry below is cured.

4. In bond beams, use special units or modify regular units to allow placement of horizontal bars. Place small mesh, expanded metal lath or wire screening in mortar joints under bond beam courses over cells of non-reinforced vertical cells.

- D. Cleanouts: Provide cleanout openings at each vertical bar at the base of walls in which one of the following applies:

1. Grout pour height exceeds 5 feet.
2. Vertical bars are not otherwise fastened to prevent displacement. In this case, use cleanout to securely tie bar in position.
3. To remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from cell and top of support in cells to be grouted.

Construct cleanout by cutting opening in face shell. Construct cleanouts with openings of sufficient size to permit removal of debris and tying of bars. Minimum size is 3 inches x 3 inches. After cleaning and inspection, close cleanout opening and brace closure to resist grout pressure.

- E. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602.
2. Place grout within 1 1/2 hours from introducing water in the mixture and prior to initial set.
3. Confine grout to the areas indicated.
4. Place grout by pumping into grout spaces unless alternate methods are acceptable to the Architect.
5. Place grout continuously in lintels and bond beams. Grout walls in lifts not exceeding 5 feet or the elevation of top of bond beam, whichever is lower.
6. If grout pour during one day exceeds 5 feet, grout in lifts 5 feet each or less, with not less than 30 minutes and not more than 1 hour between lifts.
7. Terminate grout 1-1/2 inches below bond beam course or where cell above is to be grouted.
8. Place grout in bond beam course before filling vertical cores above bond beam.
9. Consolidate grout with mechanical vibrators having a 3/4 inch diameter head. Vibrate each lift and reconsolidate after 10 minutes. Grout pours 12 inches high or less may be puddled in lieu of mechanical vibration.

3.12 FIELD QUALITY CONTROL

- A. Testing: Contractor will engage a Testing Agency, acceptable to the Owner, to perform tests and prepare reports. Allow access to scaffolding and work areas, as needed to perform tests. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Begin masonry construction only after the Testing Agency has verified proportions of site-prepared mortar.
2. Do not grout walls until reinforcing has been reviewed by Testing Agency.

- B. Testing Frequency: Four grout cubes will be sampled and tested for compressive strength per ASTM C1019 for each 5000 sq. ft. of wall surface.

- C. Masonry walls are to be inspected prior to placing grout to verify reinforcing size, spacing and laps comply with the contract documents. The Contractors Testing Agency will perform these inspections and provide written reports to the Owner, Architect, and Structural Engineer.

3.13 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained or otherwise damaged or that do not match the adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Remove all mortar fins larger than 1/2 inch within cells to be reinforced.

END OF SECTION 042900

SECTION 051200
STRUCTURAL STEEL

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. The work specified in this section includes all labor, materials, equipment, permits, and services necessary for the furnishing, fabrication and erection of structural steel and related work, complete, in accordance with the Drawings and as specified herein, including the detailing of all connections.
- B. Structural steel is that work defined in AISC "Code of Standard Practice for Steel Buildings and Bridges" and as otherwise shown on Drawings.
- C. Related Requirements:
 - 1. Section 031000 "Concrete Formwork" for Placing Anchor Rods.
 - 2. Section 033000 "Cast-In-Place Concrete" for Grouting Base Plates.
 - 3. Section 053100 "Steel Deck."
 - 4. Section 055000 "Metal Fabrication."
 - 5. Section 078100 "Applied Fireproofing."
 - 6. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" and Section 099600 "High Performance Coatings."

1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Heavy Sections: Rolled and built-up sections as follows:
 - 1. Shapes included in ASTM A6 with flanges thicker than 1-1/2 inches.
 - 2. Welded built-up members with plates thicker than 2 inches.
 - 3. Column base plates thicker than 2 inches.

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 RESPONSIBILITIES

- A. The Engineer of Record is responsible for the design of the steel framing and the connections that are fully detailed as presented in the Contract Documents.
- B. The fabricator is responsible for the preparation of Shop and Erection Drawings pursuant to the requirements of the Contract Documents. All connections that are not completely detailed on the drawings shall be designed by the Fabricator's Delegated Engineer. Submit signed and sealed connection details and calculations to the EOR for approval prior to submitting shop drawings. Once approved, the connection details may be incorporated in the shop drawings. The shop drawings are not required to be signed and sealed.
- C. The fabricator is responsible for the coordination of all surveyed field conditions and field measurements necessary for the detailing, fabrication and erection of their work. All field measurements shall be provided on the shop drawings prior to submittal.
- D. The Engineer of Record is responsible for the structural adequacy of the structure in the completed project. The erector is responsible for the means, methods and safety of the erection, including all temporary guys, beams, falsework, cribbing or other elements required for the erection operation. If the erector is unsure of these requirements, he shall retain a Florida Licensed Engineer to determine and design all temporary requirements.

1.6 PREINSTALLATION MEETINGS

- A. Preconstruction Meeting: There shall be a Preconstruction Meeting with the Owner, Architect, Structural Engineer, Contractor, Fabricator, Erector, and Testing Laboratory to clarify responsibilities and requirements as set forth in Division 01 "Project Management and Coordination".

1.7 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Submit to the Architect for acceptance, shop and erection drawings for all structural steel components. See "Shop Drawings and Other Submittals" notes regarding the possible reproduction of Structural Drawings for use as shop or erection drawings. Drawings shall include complete details, dimensions, schedules and procedures for the fabrication, assembly, and sequence of erection.
 - 2. No changes to the completed connection shown on the drawings will be considered without complying with the applicable requirements for substitutions. The fabricator shall submit details and complete calculations that clearly identify proposed substitutions for Engineer's review prior to preparation of detailed shop drawings. Proposed variations to details shown on the Contract Drawings will be considered and such variations must have preliminary acceptance prior to the preparation of detailed shop drawings. The details and calculations shall clearly show the capacity of the connections designed by the fabricator. The calculations shall show details of the assembled joint with all bolts and

- welds required. All design calculations, drawings and details for substitutions shall be signed, sealed and dated by the Delegated Engineer.
3. For structural steel connections indicated on the drawings to comply with design loads, include signed and sealed calculations by the qualified professional engineer responsible for their preparation under the following criteria:
 - a. Design all connections for the factored forces indicated on the drawings in accordance with all applicable codes and specifications.
 - b. Set connection work point at the intersection of member centerlines for all connection design and detailing.
 - c. The conceptual connections on the drawings show design intent and shall be completed for the member designated forces. Adapt those details to accommodate the atypical conditions. The conceptual connection does not show the complexity of the final connection designed for the required forces.
 - d. Design, detail, and install stiffeners, continuity plates, doubler plates as required to resist the indicated design forces. The member size is based on member behavior away from the connection.
 - e. All forces shown on the drawings act concurrently unless noted otherwise.
 - f. During bidding, if no moment is shown on the drawings, provide full moment capacity of the member of $.9 F_y Z$; and if no shear is shown, provide full shear capacity of $.6 F_y d_{tw}$. For missing tension forces, assume 95% of the tension member capacity.
 - g. Use the same bolt sizes shown on the drawings. All bolts with the same diameter shall be of the same grade. Skip one diameter size for bolts with different grades. Do not use oversized or slotted holes unless approved by EOR.
 - h. Shop drawings incorporating the design of the Delegated Engineer shall be reviewed and stamped by the Delegated Engineer prior to submittal to the EOR.
 4. Include details of cuts, connections, camber, holes, threaded fasteners and other pertinent data. Indicate welds by standard AWS A2.4 symbols and show size, length, and type of each weld. Show shop welds on shop drawings and field welds on erection drawings.
 5. Provide setting drawings, templates, and directions for installation of anchor rods, embeds and other anchorages to be installed by others.
 6. Indicate surface preparation, such as primed, galvanized, etc., of each surface of each piece.
- C. Acceptance of the Shop and Erection Drawings by the Architect/Engineer does not relieve the Fabricator of the responsibility for accuracy of detail dimensions on the shop drawings and the general fit-up of parts to be assembled in the field.
- D. Before welding is started, the steel fabricator and erector, as applicable, shall submit to the Architect a signed and sealed statement by a Florida Licensed Engineer, who specializes in the design of weldments, that he/she has provided written welding procedures for this Project, establishing the welding process, sequence of assembly, preheat, interpass and postheat requirements in general if high residual stresses are present, and in particular for all members requiring partial or complete penetration groove welding.

1.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Include lists of Qualification data for firms and persons specified in the "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.
- B. Welding certificates. Submit to Owner's inspection agency.

- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill Test Reports: Fabricator's certification that the chemical and physical properties of the following materials comply with the Project requirements:
 - 1. Structural steel
 - 2. Bolts, nuts and washers.
 - 3. Direct-tension indicators.
 - 4. Shear studs.
 - 5. Welding electrodes.
- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shear stud connectors.
 - 5. Shop primers.
 - 6. Nonshrink grout.
- F. Product Data for each type of product specified, including the following:
 - 1. Bolts, nuts, and washers, including mechanical properties.
 - 2. Direct-tension indicators.
 - 3. Shear stud connectors.
 - 4. Structural steel coatings.
 - 5. Bearing pads
- G. Fabricator's Quality Control Program.
 - 1. Include welding and testing procedures.
- H. Fabricator's shop inspection and test reports.
- I. Substantiating data for primer on Class A faying surface.

1.9 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator with a minimum five years of documented successful experience on equivalent projects. Submit copy of résumé demonstrating equivalent project experience.
- B. Installer Qualifications: A qualified installer with a minimum five years of documented successful experience on equivalent projects. Submit copy of AISC Certification and résumé demonstrating equivalent project experience.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P2 or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators." Submit copy of SSPC Certification.
- D. Qualifications for welding work: Qualify welding procedures and operators in accordance with AWS "Standard Qualification Procedure".

1. The Fabricator for shop welds and the Erector for field welds shall retain a Florida Licensed Engineer, who specializes in the design of weldments to prepare a written welding program pursuant to the requirements of AWS D1.1. The program shall include all necessary Welding Procedure Specifications (WPS), all necessary requirements for qualification testing of WPS and welding personnel. The WPS shall include the welding process, sequence of assembly, preheat, interpass and postheat requirements. Welded joints of heavy sections and plates 2 inch thick and greater shall be detailed to limit the amount of weld metal. Double bevels shall be used in lieu of single bevels. Welding shall start at the most restrained part of the weldment and proceed to the least restrained.
2. The Fabricator and Erector, as applicable, shall conduct all necessary tests required by AWS D1.1 to qualify the WPS.
3. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests for the welding process and position used and have been continuously employed as a welder since certification. If recertification of welders is required, retesting will be Contractor's responsibility.

E. Stud Application Qualification Test:

1. Prior to erection, conduct stud application qualification tests in accordance with AWS D1.1 Chapter 7.6 and Annex IX. The tests are the responsibility of the Contractor or stud applicator.
2. Prepare specimen plates of A992 steel, minimum 1/2 inch thick, with an SP-6 surface preparation.
3. Weld a minimum of ten (10) studs through steel deck to the prepared plate(s). The studs and steel deck shall be of the same type as specified for use in the project. Test the studs by the bend test specified in AWS 7.6.6 or Annex IX.
4. If the tests are conducted by other than the Owner's testing agency, that agency shall be properly notified so that they may be present to witness the entire test procedure.

F. Codes and Standards: Comply with the following, unless more stringent provisions are indicated:

1. Florida Building Code, 7th Edition.
2. AISC 360, "Specification for Structural Steel Buildings."
3. AISC 303, "Code of Standard Practice for Steel Buildings and Bridges".
 - a. Paragraph 4.4. "Approval" is modified such that the Structural Engineer will return submittals to the Architect within ten working days from time of receipt.
4. RCSC's "Specification for Structural Joints using High Strength Bolts." Approved June 22, 2010.
5. AWS D1.1 "Structural Welding Code - Steel".
6. ASTM A6 "Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling."
7. S.S.P.C. Society for Protective Coatings.
8. Occupational Safety and Health Act (OSHA), as amended to date.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site at such intervals to insure uninterrupted progress of work
- B. Deliver anchor rods and anchorage devices which are to be embedded in cast-in-place concrete or masonry in ample time to not delay work.

- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- D. Store fasteners in a protected place in sealed containers with manufacturer's labels intact until ready to use. Reseal open containers to prevent contamination by moisture or other deleterious substances. Store closed containers in a protective shelter to protect fasteners from dirt and moisture. Only as many fastener components as are anticipated to be installed during the work shift shall be taken from protective storage. Fastener components that are not incorporated into the work shall be returned to protective storage at the end of the work shift. Fasteners from open containers and fasteners that accumulate rust or dirt shall not be used and shall be immediately and permanently removed from the project site.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. Structural steel rolled W and WT shapes: ASTM A992, Grade 50.
- B. Structural steel rolled M, S, C and MC shapes and Angles: ASTM A36, Grade 36.
- C. Structural steel plates and bars: ASTM A36, Grade 36 and ASTM A572, Grade 50.
 - 1. All steel plates exceeding 2" in thickness shall conform to the requirements of ASTM A435, "Straight-Beam Ultrasonic Examination of Steel Plates", to assure delivery of steel plates free of gross internal discontinuities such as pipe, ruptures, or laminations. Plates shall be identified by stamping or stenciling "UT 435" adjacent to marking required by the material specification. The Fabricator shall submit to the Architect evidence of compliance by the mill with this requirement.
- D. Cold-formed hollow structural sections (HSS):
 - 1. Round sections: ASTM A500, Grade C, $F_y=46$ ksi.
 - 2. Square and Rectangular sections: ASTM A500, Grade C, $F_y=50$ ksi.
- E. Steel pipe: ASTM A53, Type E or S, Grade B, $F_y=35$ ksi.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. Unfinished threaded fasteners: ASTM A307, Grade A, regular low-carbon steel bolts and nuts.
 - 1. Provide square head and nuts.
- B. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F959, Type 325-1, compressible-washer type with plain finish.
- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Grade A490, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.
1. Direct-Tension Indicators: ASTM F 959, Type 490-1, compressible-washer type with plain finish.
- D. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM F3125, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
1. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50.
- E. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125, Grade F1852, Type 1, heavy-hex or round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
1. Finish: Plain.
- F. Shear Connectors: ASTM A108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B with dimensions complying with AISC specifications.
- G. Headed Anchor Rods: ASTM F 1554, Grade 55, with supplementary requirement S1, straight.
1. Nuts: ASTM A563 heavy-hex carbon steel.
 2. Plate Washers: ASTM A36 carbon steel.
 3. Washers: ASTM F 436, Type 1, hardened carbon steel.
 4. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50.

2.3 PRIMER

- A. Structural steel primer paint: SSPC – Paint 11 lead and chromate free, V.O.C. compliant, minimum solids 55% by volume. Use for steel not receiving special coatings or fireproofing or not exposed to weather. Refer to Architectural Drawings and Section 099113 “Exterior Painting,” Section 099123 “Interior Painting,” and Section 099600 “High Performance Coatings.”
1. Provide shop primer and shop applied top coat paint in accordance with Section 099113 “Exterior Painting,” Section 099123 “Interior Painting,” or Section 099600 “High Performance Coatings” where shown on the Architectural Drawings.
 2. Steel permanently exposed to the elements that does not receive a coating, such as cooling tower supports, shall be hot dip galvanized.

2.4 SHRINKAGE-RESISTANT GROUT

- A. Non-metallic shrinkage-resistant grout: Provide in accordance with Section 033000 “Cast-in-Place Concrete.”

2.5 MISCELLANEOUS

- A. Electrodes for welding: Comply with AWS D1.1-requirements.
 - 1. For complete-joint penetration groove welds, weld metal shall have a charpy V-notch impact strength of 20 ft./lbs. -20°F.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Identify high-strength structural steel according to ASTM A6 and maintain markings until structural steel has been erected.
 - 2. Mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials
 - 3. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
 - 4. Where finishing is required, complete the assembly, including welding before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- B. Camber: Camber structural-steel members as indicated on drawings.
 - 1. Where possible, camber of beams shall be applied by a cold bend process. The local application of heat may be used to introduce or correct camber, curvature, or straightness, provided the temperature of the heated area, as measured by temperature crayons or other approved means, does not exceed 1200 F.
 - 2. Where indicated on the Drawings in a camber diagram, cantilever or double cantilever beams shall be cambered for the main span and cantilever end separately, either by a staged cold bending process or by the application of heat.
 - 3. Cambers indicated on the drawings are intended to be final cambers at time of erection. The fabricator shall account for camber loss in the initial camber operations and during transportation of material to the site.
 - 4. Beams and trusses detailed without specified camber shall be fabricated so that after erection any natural camber due to rolling or shop fabrication is upward.
 - 5. Specified camber for beams at time of erection shall be within a tolerance of minus zero to plus one-eighth inch for each ten feet of member length.
 - 6. Specified camber for trusses shall be built into the fabrication process with a tolerance of minus zero to plus 10% of the specified camber.
- C. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.
 - 1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.
 - 2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
- D. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

- E. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes, or enlarge holes by burning.
 - 2. Baseplate Holes: Drill holes perpendicular to steel surfaces
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.
- F. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

2.7 CONNECTIONS

- A. Splices in Structural Steel: Splicing of structural steel members in the shop or the field is prohibited without prior approval of the Architect. Any member having a splice not shown and detailed on approved shop drawings will be rejected.
- B. Compression Joints: Compression joints which depend on contact bearing as part of the splice capacity shall have the bearing surfaces of individual fabricated pieces prepared to a common plane by milling, sawing, or other suitable means.
- C. Bearing and Fit-Up of Column Compression Joints: Compression joints of all columns shall have bearing surfaces finished to a common plane by milling, sawing, or other suitable means. Lack of contact bearing must not exceed 1/16", or corrective measures as defined by AISC Section M4.4 shall be required.
- D. Connections:
 - 1. Weld shop connections, as indicated. Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance and quality of welds and for methods used in correcting welding work.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.
 - 4. At welded beam-column flange joints, weld backing and run-off tabs shall be removed and repaired, including a 5/16" reinforcing fillet weld on the edge below the complete-joint-penetration groove weld. The exception that the top-flange backing is permitted to remain if it is attached to the column flange with a continuous fillet weld on the edge below the complete-joint-penetration groove weld.
 - 5. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specifications for Structural Joints using High Strength Bolts" for type of bolt and type of joint specified.
 - 6. Bolt field connections, except where welded connections are indicated.
 - 7. Provide high-strength, threaded fasteners except for temporary bracing to facilitate erection or otherwise indicated.
 - 8. Faying surfaces, including coatings, for slip-critical connections shall have a minimum Class A slip coefficient.
- E. Turn-of-nut method of bolt tightening is not acceptable.
- F. Compression members composed of two or more rolled shapes separated from one another by intermittent fillers shall be connected to one another at such fillers spaced at intervals so that

the least slenderness ratio, l/r , of either shape, between the fasteners, does not exceed the governing slenderness ratio of the built-up member.

- G. Struts and Braces: Connect struts and braces to resist 50% of the allowable tensile strength of the members, unless otherwise specified.
- H. Field Welded Construction: Comply with AWS D1.1 for procedures, appearance and quality of welds, and method used in correcting welding work.
- I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
- J. Holes for other work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.
- K. Provide weep hole in any confined steel surface capable of retaining water during erection or service. Seal weld as required to prevent migration of water into confined region.

2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Members not exposed to outside elements. Except columns and other steel framing inside parapet walls to be painted.
 - 2. Members or portions of members to be embedded in concrete or mortar. Prime embedded steel that is partially exposed on exposed portions and initial 2" of embedded areas only.
 - 3. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 4. Members that are to be hot dip galvanized.
 - 5. Surfaces within 2" of welds.
 - 6. The faying surfaces of slip-critical bolted connections. The exception is for members that receive a coating system. There the faying surfaces should receive a primer providing a Class A surface, with a slip coefficient of 0.33. Submit substantiating data in conformance with Appendix A of the AISC "Specification for Structural Joints".
 - 7. Mask off and do not prime a strip 2" wide on any surfaces to receive a row of headed studs or puddle welds.
- B. Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 6, "Commercial Blast Cleaning" for steel to be painted or receive a coating
 - 2. SSPC-SP 2, "Hand Tool Cleaning," or SSPC-SP 3, "Power Tool Cleaning" for all other conditions.
- C. Priming: Unless specified otherwise in Section 099113 "Exterior Painting" or Section 099123 "Interior Painting," immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 2.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces. Refer to Section 099600 "High Performance Coatings" for priming and painting members to receive special coatings.

- D. Steel members which cannot be readily painted after fabrication, such as back-to-back angles and tees, shall be primed and finish coated, or receive two coats of primer, prior to fabrication.
- E. Do not print or emboss the name of the fabricator on exposed steel unless it is completely concealed by the finish painting.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel members permanently exposed to the elements, such as cooling tower support steel, according to ASTM A123.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. Galvanize mechanical equipment support steel, lintels, and shelf angles attached to structural-steel frame and located in exterior walls.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, bearing pads, and other embedments for compliance with requirements.
 - 1. Surveys: Employ a Florida Licensed Engineer or Land Surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary shoring and bracing: Provide temporary shoring and bracing members and connections of sufficient strength to bear imposed loads from steel self weight and erection procedures or any other loads created by other contractors on a temporary basis. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guidelines to achieve proper alignment of structures as erection proceeds.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.
- B. Temporary planking: Provide temporary planking and working platforms as necessary to effectively complete work.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and base plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
 - 5. Base plates must be grouted a minimum of 72 hours prior to placing concrete slabs on supporting steel structure.
- C. Anchor rods and bolts: Furnish anchor rods, bolts and other connectors required for securing structural steel to foundations and other in-place work.
 - 1. Furnish templates and other devices as necessary for pre-setting rods, bolts and other anchors to accurate locations.
 - 2. Refer to Section 3 of these specifications for anchor rod installation requirements in concrete, and Section 4 for masonry installation.
- D. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- E. Field assembly: Set structural members accurately to lines and elevations indicated. Align and adjust various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment. Comply with AISC Code of Standard Practice except where more stringent requirements are contained herein.
 - 1. Level and plumb individual members of structure within specified AISC tolerances.
 - 2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- F. Erection bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.
- G. Comply with AISC Specification for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
- H. Splice members only where indicated and accepted on shop drawings.
- I. Thermal cutting: Do not use gas-cutting torches in field for correcting fabrication errors in primary structural framing. When permitted, finish gas-cut sections equal to a sheared appearance by grinding or reaming. Do not use gas cutting to fabricate bolt holes.

- J. Do not enlarge unfair holes in members by burning or by use of drift pins. Ream holes that must be enlarged to admit bolts as permitted by Architect.
- K. Headed shear studs: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions. All welding ferrules for shear connectors shall be removed prior to placement of concrete.

3.4 FIELD CONNECTIONS

- A. Store fastener components in sealed containers until ready for use. Reseal open containers to prevent contamination by moisture or other deleterious substances. Store closed containers from dirt and moisture in a protective shelter. Take from protective storage only as many fastener components as are anticipated to be installed during the work shift. Fastener components that are not incorporated into the work shall be returned to protective storage at the end of the work shift. Fasteners from open containers and fasteners that accumulate rust or dirt shall not be used and shall be immediately and permanently removed from the project site.
- B. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High Strength Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- C. Tighten bearing-type bolts (GR A325N, GR A325X, GR A490N, and GR A490X) to the snug tight condition as follows:
 - 1. Bolts shall be placed in all holes, with washers positioned as required and nuts threaded to complete the assembly.
 - 2. Compacting the joint to the snug-tight condition shall progress systematically from the most rigid part of the joint.
 - 3. The snug-tightened condition is the tightness that is attained with a few impacts of an impact wrench or the full effort of an ironworker using an ordinary spud wrench.
 - 4. More than one cycle through the bolt pattern may be required to achieve the snug-tightened joint.
- D. Tighten slip-critical bolts (GR A325SC, GR A325TC, GR A490SC, and GR A490TC) to the minimum fastener tension indicated in Table 8.1 of the "Specification for Structural Joints using High Strength Bolts" as follows:
 - 1. Confirm with Architect on which face of the connection the round head of the TC bolt shall be located for exposed connections.
 - 2. Begin final tightening of slip-critical bolts only after a snug-tight joint as described above is achieved. Progress systematically from the most rigid part of the joint.
 - 3. If splined end of tension-control bolts is severed prior to achieving snug-tight joint, remove and replace the fastener assembly.
 - 4. Progress systematically from the most rigid part of the joint in a manner that will minimize relaxation of previously pretensioned bolts.
 - 5. Determine tension using either load indicator washers, tension-control bolts, or a calibrated torque wrench.
- E. Provide hardened washers conforming to ASTM F436 and place under the part being turned.

- F. Do not reuse or retighten bolts which have been fully tightened. Use only non-galvanized nuts and bolts that are clean, rust-free, and well lubricated. Bolts and nuts shall be wax dipped by the bolt supplier or lubricated with Castrol Industrial Stick Wax.
- G. Cleaning and lubrication of ASTM F3125, GR F1852 and GR F2280 twist-off-type tension-control bolt assemblies is not permitted.
- H. Where slotted holes are used to accommodate thermal movement, notify the Architect if bolt is expected to hit the end of slot, based on temperature at time of installation.
- I. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and for used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.
- J. Protect bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.

3.5 QUALITY CONTROL

- A. Shop Quality Control:
 - 1. The Fabricator shall provide a system of quality control, including shop welding inspections and testing, to ensure that the minimum standards specified herein are attained. Submit to Owner, Architect, Engineer and Owner's Testing and Inspection Agency complete details of the quality control program to be used and all testing and inspection reports. Visually inspect 100% of shop welds. Also, as a minimum, perform non-destructive tests of welds in conformance with AWS D1.1 as follows:
 - a. Splices: 100%.
 - b. Full penetration welds: 100%.
 - c. Partial penetration welds: 50%.
 - d. Fillet welds: 5%.
 - 2. The fabricator may use the following examination methods, in descending order of importance. When a particular examination method for a joint is unfeasible, the highest order method that is practicable shall be used. Standard of acceptance shall be in accordance with AWS D1.1.
 - a. Ultrasonic Method: In accordance with AWS D1.1.
 - b. Radiographic Method: In accordance with ASTM E94 and ASTM E142, with a minimum quality level of "2-2T". This procedure is limited to the inspection of groove welds in butt joints only and is not to be used for fillet welds.
 - c. Magnetic Particle Method: In accordance with ASTM E709. Use for examining partial penetration welds. Percentage of examinations is defined elsewhere in these specifications. The Yoke method may be used only for supplementary surface examination.

- d. Dye Penetrant Examination Method: In accordance with ASTM E165.
3. The Fabricator shall ultrasonically inspect for laminations all joints where material is subjected to tension in the through thickness direction. Ultrasonic inspection shall extend for a distance of six times the material thickness subject to the through thickness tension, either side of the element delivering the tension.
- B. Contractor will engage a Structural Inspector / Testing Agency, acceptable to the Owner, to perform field inspections.
- C. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
- D. Provide access for testing agency to places where structural steel work is being fabricated or produced and unobstructed views to all members in nearby storage so that required inspection and testing can be accomplished.
- E. Testing agency may inspect structural steel at plant before shipment; however, Architect reserves the right, at any time before final acceptance, to reject material not complying with specified requirement.
- F. Correct deficiencies in structural steel work which inspections or laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any noncompliance of original work, and as may be necessary to show compliance of corrected work.
- G. Shop Inspection and Tests: Testing Agency may inspect and test during fabrication of structural steel assemblies, as follows:
 1. Review shop drawings and shop procedures with Fabricator's supervisory personnel.
 2. Request and obtain necessary mill certifications of steel and verify proper material throughout the duration of the job.
 3. Verify welding procedure qualifications, either by prequalifications or by witnessing qualification tests.
 4. Verify welder qualifications, either by certification and/or by retesting. Obtain welder certificates.
 5. Spot check layout and dimensions of jigs and fixtures for joint preparation, and fit up of members.
 6. Verify welding electrodes to be used and other welding consumables as the job progresses.
 7. Check preheating procedures for conformance to AWS D1.1.
 8. Verify procedures for welding in accordance with applicable portions of section 4, "Technique", AWS D1.1.
 9. Verify that quality of welds meet the requirements of Paragraph B.15, "Quality of Welds", AWS D1.1.
 10. Provide inspection of surface preparation for coating and coating operations in accordance with SSPC VIS 1 and 2.
 11. Perform visual inspection of all welds for compliance with Contract Documents. Provide random non-destructive tests of welds in conformance with Section 6 of AWS D1.1, as may be required by Architect, but not less than:
 - a. Full penetration welds: 25%.
 - b. Partial penetration welds: 15%.
 - c. Fillet Welds: 5%.

12. Testing laboratory may use the following examination methods, in descending order of importance. When a particular examination method for a joint is unfeasible, the highest order method that is practicable shall be used. Standard of acceptance shall be in accordance with AWS D1.1.
 - a. Ultrasonic Method: In accordance with AWS D1.1.
 - b. Radiographic Method: In accordance with ASTM E94 and ASTM E142, with a minimum quality level of "2-2T". This procedure is limited to the inspection of groove welds in butt joints only and is not to be used for fillet welds.
 - c. Magnetic Particle Method: In accordance with ASTM E709. Use for examining partial penetration welds. Percentage of examinations is defined elsewhere in these specifications. The Yoke method may be used only for supplementary surface examination.
 - d. Dye Penetrant Examination Method: In accordance with ASTM E165.
 13. Ultrasonically inspect for laminations after welding all joints with rolled shapes and plates greater than 1 1/2" thick, where material is subjected to tension in the through thickness direction. The ultrasonic inspection shall extend for a distance of six times the thickness of the plate receiving the through thickness tension, either side of the plate delivering the tension.
 14. Interpret, record, and report all results of the non-destructive tests.
 15. Mark for repair, any area not meeting Specification requirements. Correction of rejected welds shall be made in accordance with Paragraph 5.26, "Repairs", AWS D1.1
 16. Re-examine all repair areas and interpret, record, and report the results of examinations of repair welds.
- H. Field Inspection and Tests: Inspect and Test during the erection of structural steel assemblies as directed by the Engineer of Record, but not less than the following:
1. Verify field welding procedures and obtain welder certificates.
 2. Check joint preparation and fit up, backing strips, and runout plates.
 3. Check preheating to assure proper temperature, uniformity, and thoroughness through the full material thickness.
 4. Review welding sequence.
 5. Inspector shall perform visual inspection of all welds for compliance with Contract Documents. Testing Agency shall perform non-destructive tests of welds in conformance with Section 6 of AWS D1.1 as may be required by Architect, but not less than:
 - a. Splices: 100%.
 - b. Full Penetration Welds: 100%.
 - c. Partial Penetration Welds: 50%.
 - d. Fillet Welds: All welds that do not pass the visual inspection.
 6. Check 100% of bolted connections according to inspection procedures outlined in the "Specification for Structural Joints using High Strength Bolts" and as required elsewhere in these specifications.
 7. Production Stud Application Testing: Test the first two studs per welder per day for each set-up and size and type of stud. Test by bending studs 30 degrees using a 4 lb. hammer per AWS D1.1 Section 7.7. Use a 4 lb. hammer to sound 100% of studs. A pinging sound usually represents a sound weld. Studs that produce a "thud" should be bend tested. Passing studs may remain bent while failing studs must be replaced.
 8. Interpret, record, and report all results of the non-destructive tests.
 9. Mark for repair any area not meeting Specification requirements. Correction of rejected welds shall be made in accordance with Paragraph 5.26, "Repairs", AWS D1.1.
 10. Re-examine all repair areas and interpret, record, and report the results of examinations of repair welds.

- I. Pre-installation testing of as-received fastener assemblies shall be performed according to the Specifications for Structural Joints using High Strength Bolts, Section 7 and as follows:
 1. Tension Calibrator (a hydraulic device that indicates the pretension that is developed in a bolt that is installed in it) shall be provided by the testing agency, at the Project Site, to confirm the tension force in the fastener assembly.
 2. A sample of not fewer than three complete fastener assemblies from each shipping container shall be checked at the site.
 3. Fastener assemblies tested shall develop a pretension force not less than 1.05 times that required by Table 8.1 in AISC. Minimum passing test force: A325: 3/4"=29.4 kips, 7/8"=41.0 kips, 1"=53.6 kips; A490: 3/4"=36.8 kips, 7/8"=51.4 kips, 1"=67.2 kips.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780.
 1. Apply Zinc-Clad Cold Galvanizing by Sherwin-Williams or Cold Galvanizing Compound by ZRC Worldwide by brush or spray to provide a minimum dry film thickness of 3 mils.
- B. Touchup Painting: Immediately after erection, clean slag from field welds, clean bolted connections, and abraded areas of shop paint. Apply paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Priming: For steel having special coatings system, reapply both primer and top coat as specified in Section 099600 "High-Performance Coatings."

END OF SECTION 051200

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SECTION 053100

STEEL DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Roof deck.
 - 2. Composite floor deck.
- B. Related Sections include the following:
 - 1. Section 033000 "Cast-in-Place Concrete" for concrete fill over steel deck
 - 2. Section 035216 "Lightweight Insulating Concrete" for lightweight insulating concrete fill over steel deck
 - 3. Section 051200 "Structural Steel Framing" for shop and field welded shear connectors.
 - 4. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated, or requested by the Architect.
- B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding Certificates: Copies of certificates for welding procedures and personnel. Submit to general contractor and Special Inspector.
- B. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.
- C. Product Test Reports: Based on evaluations of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.

- D. Research Reports: For steel deck, from ICC-ES.
- E. Field quality-control test and inspection reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E329 to conduct the testing indicated, as documented according to ASTM E548.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel," and AWS D1.3, "Structural Welding Code - Sheet Steel."
- C. Manufacturer Qualifications: Member of the Steel Deck Institute.
- D. Installer Qualifications: An experienced installer who has completed steel deck installations 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.
- E. Fabrication and Erection: Fabricate and erect deck per the Steel Deck Institute's "Design Manual for Composite Decks, Form Decks and Roof Decks".
 - 1. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
- F. Codes and Standards: Comply with Florida Building Code, 7th Edition.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. 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 acceptable to authorities having jurisdiction.

2.2 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Steel Deck:
 - a. Canam Steel Corporation: Canam Group Inc.
 - b. Coredeck
 - c. DACS, Inc.
 - d. Epic Metals Corporation.
 - e. Marlyn Steel Decks, Inc.
 - f. New Millennium Building Systems, LLC
 - g. Nucor Corporation.
 - h. Nucor Corporation, Verco Group
 - i. Roof Deck, Inc.

2.3 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and the following:
1. Galvanized Steel Sheet: ASTM A653, Structural Steel (SS), Grade 40 [80], G90 zinc coating.
 2. Deck Profile; Depth and Design Uncoated-Steel Thickness: As indicated on Drawings.
 3. Span Condition: Triple span typical, double span minimum, U.O.N. on Drawings.
 4. Side Laps: Overlapped.

2.4 COMPOSITE FLOOR DECK

- A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, the minimum section properties indicated, and the following:
1. Galvanized Steel Sheet: ASTM A653, Structural Steel (SS), Grade 40, G60 and G90 zinc coating as indicated on plans.
 2. Shear Lugs (Web Embossments): 0.050 inch high (min.).
 3. Profile Depth and Design Uncoated-Steel Thickness: As indicated on Drawings.
 4. Span Condition: Triple span typical, double span minimum, U.O.N. on Drawings.

2.5 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- G. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth unless otherwise indicated.
- H. Column Closures, End Closures, Z-Closures, and Cover Plates:
 - 1. Epicore Metals Corporation: Sheet steel of same material and finish, 10 gauge or less, unless otherwise indicated.
 - 2. All others: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- I. Provide recessed or flat sump pan in accordance with roof drain requirements. Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. Recessed sump pans shall have with 3-inch wide flanges and be leveled recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- J. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight. Manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Galvacon Cold Galvanizing Compound: Lanco Inc.
 - 2. ZRC Cold Galvanizing Compound: ZRC Worldwide, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Deck has been designed to span unshored, U.O.N. on Drawings.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may not be used in lieu of welding to fasten deck unless specifically allowed by the local product approval for the roofing system and approved by the Engineer of Record. Provide mechanical fasteners according to deck manufacturer's written instructions and per the Structural Notes on the Drawings.

3.3 ROOF DECK INSTALLATION

- A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated as follows:
 - 1. Weld Diameter: As indicated on the Drawings.
 - 2. Weld Spacing: Weld deck units as indicated on the Drawings.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, as indicated on the Drawings.
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches apart with at least 1 weld at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.
- E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated at non-fire-resistance-rated partitions. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FLOOR DECK INSTALLATION

- A. Fasten floor deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: As indicated on the Drawings.
 2. Weld Spacing: Space and locate welds as indicated on the drawings.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, as indicated on the Drawings.
1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
1. End Joints: Butted at composite floor deck and lapped or butted at noncomposite form deck.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.
- E. Floor Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of decking. Weld cover plates at changes in direction of floor deck panels, unless otherwise indicated.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

3.6 FIELD QUALITY CONTROL

- A. Testing: Contractor will engage a qualified independent testing agency, acceptable to the Owner, to perform field quality-control testing.
- B. Field welds will be subject to inspection.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional testing and/or inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.
- F. Testing agency to send reports directly to the Architect and Engineer at the same time as provided to Contractor.

END OF SECTION 053100

SECTION 054000

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Exterior non-load-bearing wall framing.
- 2. Soffit framing.

- B. Related Requirements:

- 1. Section 033000 "Cast-In-Place Concrete."
- 2. Section 055000 "Metal Fabrications".
- 3. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
- 4. Section 092216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data and Installation Instructions: For each type of cold-formed steel framing product and accessory, including fasteners, materials, and finishes.

- B. Shop Drawings:

- 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
- 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - a. For cold-formed metal framing indicated to comply with design loads, shop drawings and calculations shall be signed and sealed by the delegated (specialty) engineer responsible for their preparation.

- C. Delegated-Design Submittal: For cold-formed steel framing.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project

name and addresses, names and addresses of architects and owners, and other information specified.

- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.
- D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- B. Qualifications:
 - 1. Fabricator Qualifications: Company with not less than five (5) documented satisfactory experiences designing and fabricating cold-formed steel framing systems equal in material, design and extent to the systems required for this Project.
 - 2. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. 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. Engineering Responsibility: Engage a delegated licensed engineer to prepare design calculations, Shop Drawings, and other structural data.
- E. Delegated Engineer: A licensed engineer who is legally qualified to practice in 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 cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- F. Codes and Standards: Comply with the following, unless more stringent provisions are indicated:
 - 1. Florida Building Code, 7th Edition.
 - 2. ASCE 7, "Minimum Design Loads for Buildings and Other Structures."
 - 3. AWS D1.1, "Structural Welding Code - Steel."
 - 4. AWS D1.3, "Structural Welding Code - Sheet Steel."

See "Performance Requirements" for additional codes and standards.

1.6 FIELD MEASUREMENTS

- A. Verify all dimensions and conditions by field measurement. Indicate and flag on shop drawings all discrepancies between actual conditions and contract documents.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's unopened containers or bundles, fully identified by manufacturer's name, job number, and member number. Exercise care to avoid damage during unloading, storing and erection.
- B. Store framing members on blocking, pallets, platforms or other supports off the ground, sufficiently braced to avoid damage from excessive bending.
- C. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

1.8 PROJECT CONDITIONS

- A. During construction, adequately distribute all loads applied to member so as not to exceed the carrying capacity of any framing member.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AllSteel & Gypsum Products, Inc.
 - 2. ClarkWestern Building Systems, Inc.
 - 3. Consolidated Fabricators Corp.; Building Products Division.
 - 4. Craco Mfg., Inc.
 - 5. Dietrich Metal Framing; a Worthington Industries Company.
 - 6. MarinoWARE.
 - 7. Nuconsteel; a Nucor Company.
 - 8. SCAFCO Corporation.
 - 9. Southeastern Stud & Components, Inc.
 - 10. Steel Construction Systems.
 - 11. Steel Network, Inc. (The).
 - 12. Steel Structural Systems.
 - 13. Super Stud Building Products, Inc.
 - 14. Telling Industries, LLC.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated on drawings or required by Code.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/240 of the wall height.
 - b. Soffit Framing: Vertical deflection of 1/240 of the horizontally projected span for live loads.
 - 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 3/4 inch.
 - 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Design Standards:
 - 1. Floor and Roof Systems: AISI S210.
 - 2. Wall Studs: AISI S211.
 - 3. Headers: AISI S212.
 - 4. Lateral Design: AISI S213.
- D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Steel Sheet: ASTM A 1003, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G60.

- B. Steel Sheet for Vertical Deflection Drift Clips: ASTM A 653, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G60.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch.
 - 2. Minimum Flange Width: 1-5/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: Matching steel studs.
 - 2. Minimum Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard bypass and/or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
 - 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. AllSteel & Gypsum Products, Inc.
 - b. ClarkWestern Building Systems, Inc.
 - c. Dietrich Metal Framing; a Worthington Industries company.
 - d. MarinoWARE.
 - e. Steel Network, Inc. (The).
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - 1. Minimum Base-Metal Thickness: Matching steel studs
 - 2. Flange Width: 1 inch plus the design gap for one-story structures and 1 inch plus twice the design gap for other applications.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
 - 1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: Matching steel studs.
 - b. Minimum Flange Width: 1 inch plus the design gap for one-story structures and 1 inch plus twice the design gap for other applications.

2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: Matching steel studs.
 - b. Flange Width: Dimension equal to sum of outer deflection track flange width plus 1 inch.
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 0.0428 inch.
 2. Flange Width: 1-5/8 inches, minimum.

2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.
 4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.
 8. Stud kickers and knee braces.
 9. Joist hangers and end closures.
 10. Hole reinforcing plates.
 11. Backer plates.

2.7 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.
- B. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- C. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

- D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- E. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.
- B. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- C. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.9 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- I. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to bypassing studs and anchor to building structure.
 - 4. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - a. Install solid blocking at centers indicated on Shop Drawings.
 - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION (Soffits)

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
 - 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
 - 1. Joist Spacing: As required by soffit panel system.
- D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
 - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to bottom flange of joists.
 - 2. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
 - 3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

- A. Inspection: Contractor will engage a qualified inspection agency, acceptable to the Owner, to perform inspections.
- B. Field and shop welds will be subject to inspection.

- C. Remove and replace work that does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Testing agency to send reports directly to the Architect and Engineer at the same time as provided to Contractor.

3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

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**SECTION 055000
METAL FABRICATIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel and aluminum items.
- B. Prefabricated ladders and rails.

1.02 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).
- B. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements 2018.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- G. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.
- H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2021.
- I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- J. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
- K. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire 2012.
- L. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric) 2012.
- M. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2019, with Editorial Revision (2020).
- N. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.
- O. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.
- P. AWS D1.2/D1.2M - Structural Welding Code - Aluminum 2014, with Errata.
- Q. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel 2018.
- R. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).
- S. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).
- T. SSPC-SP 2 - Hand Tool Cleaning 2018.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.
- D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.04 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.
- F. Slotted Channel Fittings: ASTM A1011/A1011M.
- G. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- I. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

- A. Aluminum-Alloy Bars: ASTM B211 (ASTM B211M), 6061 alloy , T6 temper.
- B. Bolts, Nuts, and Washers: Stainless steel.
- C. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

- A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; galvanized finish.
 1. Side Rails: 3/8 x 2 inches members spaced at 20 inches.
 2. Rungs: one inch diameter solid round bar spaced 12 inches on center.
 3. Space rungs 7 inches from wall surface.
 4. Provide a lockable ladder access prevention system.
- B. Bollards: Galvanized steel.
- C. Lintels: As detailed; galvanized finish.
- D. Sill Angles for Tempered Glass Railing Assemblies: ASTM A36/A36M steel angles with anchoring devices and sizes as indicated in shop drawings for railing assembly, drilled and

tapped for fastener types, sizes, and spacing indicated, prime paint finish.

- E. Door Frames for Overhead Door Openings: Channel sections; prime paint finish.
- F. Elevator Hoistway Divider Beams: Beam sections; prime paint finish.

2.05 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items specified for galvanized finish.
 - 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required.
 - 3. Exception: Do not paint items in drawings with "Blackened Steel" finish designation.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

2.06 FINISHES - ALUMINUM

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.07 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- 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.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components as indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 055000

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**SECTION 055100
METAL STAIRS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Stairs with concrete treads.
- B. Structural steel stair framing and supports.
- C. Handrails and guards.
- D. Prefabricated stair treads and nosings.

1.02 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures 2006.
- C. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling 2019.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.
- F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.
- G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2021.
- H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
- J. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2019, with Editorial Revision (2020).
- K. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.
- L. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.
- M. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).
- N. SSPC-SP 2 - Hand Tool Cleaning 2018.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Include the design engineer's seal and signature on each sheet of shop drawings.
- C. Design Data: As required by authorities having jurisdiction.
- D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 201.

1.04 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in Florida, or personnel under direct supervision of such an engineer.
- B. Fabricator Qualifications:
 - 1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

- A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
 - 1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
 - 2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
 - 3. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.
 - 4. Dimensions: As indicated on drawings.
 - 5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
 - 6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
 - 7. Separate dissimilar metals using paint or permanent tape.
- B. Metal Jointing and Finish Quality Levels:
 - 1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
 - a. Welded Joints: Continuously welded and ground smooth and flush.
 - b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
 - c. Exposed Edges and Corners: Eased to small uniform radius.
 - d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.
- C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

- A. Jointing and Finish Quality Level: Architectural, as defined above.
- B. Risers: Closed.
- C. Treads: Metal pan with field-installed concrete fill.
 - 1. Concrete Depth: 1-1/2 inches, minimum.
 - 2. Tread Pan Material: Steel sheet.
 - 3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch minimum.
 - 4. Pan Anchorage to Stringers: Welded to carrier angles welded to stringers.
 - 5. Concrete Reinforcement: Welded wire mesh.
 - 6. Concrete Finish: Steel troweled.
- D. Risers: Same material and thickness as tread pans.
 - 1. Riser/Nosing Profile: Vertical riser with underside of nosing sloped up from bottom of tread pan at not less than 60 degrees from horizontal, with rounded top of nosing of minimum radius.
 - 2. Nosing Depth: Not more than 1 inch overhang.
 - 3. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.
- E. Stringers: Rolled steel channels.
 - 1. Stringer Depth: As indicated on drawings.

2. End Closure: Sheet steel of same thickness as risers welded across ends.
- F. Landings: Similar construction, using corrugated steel decking, supported and reinforced as required to achieve design load capacity.
- G. Railings: See drawings for materials and configuration requirements..
- H. Finish: Shop- or factory-prime painted.
- I. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces unless noted otherwise in drawings.

2.03 HANDRAILS AND GUARDS

- A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
 1. Outside Diameter: 1-1/2 inches.
- B. Guards:
 1. Top Rails: Round pipe or tube rails unless otherwise indicated.
 - a. Outside Diameter: 1-1/2 inches.
 2. End and Intermediate Posts: Same material and size as top rails.
 - a. Horizontal Spacing: As indicated on drawings.
 - b. Mounting: Welded to top surface of stringer.

2.04 MATERIALS

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.
- C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.
- E. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
 1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
 2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
- F. Concrete Fill: Portland cement Type I, 3000 psi 28 day strength, 2 to 3 inch slump.
- G. Concrete Reinforcement: Mesh type as detailed, galvanized.

2.05 ACCESSORIES

- A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.
- B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- C. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.

2.06 SHOP FINISHING

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prime Painting: Use specified shop- and touch-up primer.
 1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
 2. Number of Coats: One.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. When field welding is required, clean and strip primed steel items to bare metal.

- B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

3.03 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.
- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
- F. Obtain approval prior to site cutting or creating adjustments not scheduled.
- G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION 055100

**SECTION 055213
PIPE AND TUBE RAILINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Stair railings and guardrails.
- B. Free-standing railings at ramps.
- C. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 042000 - Unit Masonry: Placement of anchors in masonry.
- C. Section 055100 - Metal Stairs: Handrails other than those specified in this section.

1.03 REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- C. ASTM A204/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strips for pressure vessels and for general applications; 2015b.
- D. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube 2016.
- E. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube 2020.
- F. ASTM B483/B483M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Tube and Drawn Pipe for General Purpose Applications 2021.
- G. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings 2021.
- H. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings 2000 (Reapproved 2006).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
- B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- D. Dimensions: See drawings for configurations and heights.
- E. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

1. For anchorage to concrete, provide inserts to be cast into concrete, for welding anchors.
2. For anchorage to masonry, provide brackets to be embedded in masonry, for welding anchors.

2.02 EXTERIOR HANDRAILS AND GUARDRAILS

- A. Aluminum Tube: Minimum wall thickness of .25 inch; ASTM B429/B429M, ASTM B241/B241M, or ASTM B483/B483M.
- B. Solid Bars and Flats: ASTM B211 (ASTM B211M).
- C. Welding Fittings: No exposed fasteners; machined aluminum.
- D. Straight Splice Connectors: Concealed spigot; cast aluminum.
- E. Exposed Fasteners: No exposed bolts or screws.
- F. Surface cleaning: Aluminum surfaces must be clean and free of oil and grease before finish coating applied.
- G. Surface Preparation: Remove surface aluminum oxide by sweep blasting or phosphate treatment. Apply chemical pretreatment of surface (such as application of phosphoric acid) prior to powder coating to promote adhesion.

2.03 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
 1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
 3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

2.04 ALUMINUM FINISHES

- A. High Performance Organic Coating System: AAMA 2604 multiple coat, thermally cured fluoropolymer system.
- B. Color: To be selected by Architect from manufacturer's full line.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.
- C. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

- C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.
- E. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 055213

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**SECTION 057000
DECORATIVE METAL**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Railing and guardrail assemblies.

1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- D. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes 2017.
- E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.
- F. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing 2021.
- G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- H. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings 2020.
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
- J. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass 2019.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.
- L. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel 2017.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Schedule and conduct a preinstallation meeting one week before starting work of this section. Attendees shall include, but not be limited to:
 - 1. Contractor.
 - 2. Manufacturer's representative.
 - 3. Architect.
 - 4. Owner's representative.
 - 5. Other subcontractors of adjacent work.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's product data including description of materials, components, finishes, fabrication details, glass, anchors, and accessories.
- C. Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.
- D. Samples: Submit one (1) of each item below for each type and condition shown.
 - 1. Glass: 12 inch by 12 inch, illustrating color, thickness and edge condition.
 - 2. Railing: 12 inch long section of handrail illustrating color, finish and connection detail.
 - 3. Cladding: 12 inch by 12 inch sample of each type of cladding, illustrating finish.
- E. Manufacturer's Installation Instructions.
- F. Maintenance Data: Manufacturer's instructions for care and cleaning.

- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Installation by manufacturer or an installer certified by the manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in factory provided protective coverings and packaging.
- B. Protect materials against damage during transit, delivery, storage, and installation at site.
- C. Inspect materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.
- D. Prior to installation, store materials and components under cover, in a dry location.

1.07 FIELD CONDITIONS

- A. Do not install railings until project is enclosed and ambient temperature of space is minimum 65 degrees F and maximum 95 degrees F.
- B. Maintain ambient temperature of space at minimum 65 degrees F and maximum 95 degrees F for 24 hours before, during, and after railing installation.

1.08 WARRANTY

- A. Warranty: Manufacturer's standard one year warranty against defects in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion.

1.09 MANUFACTURERS

- A. Decorative Metal Railings:
 - 1. C. R. Laurence Co., Inc: www.crl-arch.com.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Railing Components:
 - 1. C. R. Laurence Co., Inc: www.crl-arch.com.

1.10 RAILING SYSTEMS

- 1. Design Criteria: Design and fabricate railings and anchorages to resist the following loads without failure, damage, or permanent set; loads do not need to be applied simultaneously.
 - a. Handrails: Comply with applicable accessibility requirements of ADA Standards.
- 2. Welded and Brazed Joints: Make exposed joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
 - a. Ease exposed edges to small uniform radius.
 - 1) Carbon Steel: Perform welding in accordance with AWS D1.1/D 1.1M.
 - 2) Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.
- B. Structural Glass Railing System, Base-Mounted: Engineered, base supported railing system with structural glass.
 - 1. Top Rail: GRS 2 1/2" square premium cap
 - 2. Base Shoe, Aluminum (glass guardrail): ASTM B221 or ASTM B221M, 6063 alloy, T5 temper; 2-9/16" inch wide by 4-1/4" inch high, rectangular profile.
 - a. Type: CRL Fascia Mount Detail - Steel Substrate.
 - b. Cladding: Aluminum base shoes are to be clad in stainless steel with a No. 4 satin finish.
 - 3. Glass: As specified in this section.
 - 4. Stainless Steel Finish, Exposed Surfaces: No. 4 satin finish.
 - 5. Aluminum Finish, Exposed Surfaces: Matte Bronze.
 - 6. Fasteners:

- a. Attachment to Concrete:
 - 1) Provide anchors capable of sustaining, without failure, a load equal to four times the load imposed when installed in concrete, tested in accordance with ASTM E488/E448M.
- 7. Basis of Design: C.R. Laurence Co., Inc; "CRL GRS For Tempered Monolithic 1/2", 5/8" & 3/4" Thick Glass.

1.11 MATERIALS

- A. Aluminum Components: ASTM B221 or ASTM B221M. ASTM B209 or ASTM B209M.
 - 1. Matt Bronze.
- B. Stainless Steel Components:
 - 1. Stainless Steel Tubing: ASTM A554, Type 304, 16 gage, 0.0625 inch minimum metal thickness, 1-1/2 inch diameter.
 - 2. Stainless Steel Finish: No. 4 Bright Polished finish.
- C. Glass: Laminated safety glass; ASTM C1172, unless otherwise indicated.
 - 1. Plastic Interlayer: Minimum 0.060 inch thick.
 - 2. Thickness: 3/4 inch (thickness contingent on engineered product).
 - 3. Configuration: As indicated on drawings.
 - 4. Color (Guard Rail): Clear.

1.12 ACCESSORIES

- A. Anchors and Fasteners: Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
 - 1. For anchorage to concrete, provide inserts to be cast into concrete for bolting anchors.
 - 2. For anchorage to masonry, provide brackets to be embedded in masonry for bolting anchors.
 - 3. For anchorage to stud walls, provide backing plates for bolting anchors.
 - 4. Exposed Fasteners: No exposed bolts or screws.
- B. Carbon Steel Bolts and Nuts: ASTM A307.

PART 3 EXECUTION

2.01 EXAMINATION

- A. Verify that substrate and site conditions are acceptable and ready to receive work.
- B. Verify field dimensions of locations and areas to receive work.
- C. Notify Architect immediately of conditions that would prevent satisfactory installation.
- D. Do not proceed with work until detrimental conditions have been corrected.
- E. Furnish components to be installed in other work to installer of that other work, including but not limited to blocking, sleeves, inserts, anchor bolts, embedded plates and supports for attachment of anchors.

2.02 PREPARATION

- A. Protect existing work.
- B. Review installation drawings before beginning installation. Coordinate diagrams, templates, instructions and directions for installation of anchorages and fasteners.
- C. Clean surfaces to receive units. Remove materials and substances detrimental to the installation.

2.03 INSTALLATION

- A. Comply with manufacturer's drawings and written instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects and with tight joints, except where necessary for expansion.
- C. Anchor securely to structure.

- D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- E. Weld connections that cannot be shop welded due to size limitations.
 - 1. Weld in accordance with AWS D1.1/D1.1M.
 - 2. Match shop welding and bolting.
 - 3. Clean welds, bolted connections and abraded areas.
 - 4. Touch up shop primer and factory applied finishes.
 - 5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.
- F. Isolate dissimilar materials with bituminous coating, bushings, grommets or washers to prevent electrolytic corrosion.

2.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

2.05 FIELD QUALITY CONTROL

- A. Field Services: Provide the services of the manufacturer for field observation of installation of railings.

2.06 CLEANING

- A. Remove protective film from exposed metal surfaces.
- B. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents or other substances that may damage the material or finish.

2.07 PROTECTION

- A. Protect installed components and finishes from damage after installation.
- B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.
 - 1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

SECTION 057310
GLASS RAILING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Monolithic Tempered Glass Dry Glazed Railing Assemblies.

1.2 RELATED SECTIONS

- A. Section 055000 - Metal Fabrications
- B. Section 055213 – Pipe and Tube Railings
- C. Section 088000 - Glazing

1.3 REFERENCES

- A. ESR-3269 ICC-ES Evaluation Report, International Code Council Standards for Glass Balustrade Guard Rail Applications
- B. ASTM C 1048 – Standard Specification for Heat Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass
- C. NAAMM Metal Finishes Manual; national Association of Architectural Metal Manufacturers

1.4 SYSTEM DESCRIPTION

- A. Performance Requirements for Handrail Assembly:
 - 1. Support distributed load of 50 pounds per linear foot (0.73kN/M), applied horizontally at right angles in any direction to the handrail.
 - 2. Support concentrated horizontal load of 200 pounds (0.89kN), applied in any direction at any point along handrail system.
 - 3. 50 lbs (0.22kN) on 1 sf (0.093m²) perpendicular to guard at any location
 - 4. Wind loads 25 psf or as otherwise specified.
 - 5. Distributed loads and concentrated loads not to be applied simultaneously.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 3300.
- B. Product Data: Submit Manufacturer's technical product data for railing components and accessories.
- C. Shop Drawings: Dimensioned drawings of railing assemblies indicating the following:
 - 1. Elevations; include joint locations, transitions, and terminations.
 - 2. Manufacturer's installation and maintenance instructions.
- D. Samples of manufacturer's finishes (As selected by Architect.)

1.6 QUALITY ASSURANCE

- A. Components and installation are to be in accordance with state and local building codes.

- B. All components and fittings are furnished by the same manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials properly protected against damage to finished surfaces during transit.
- B. Inspect materials upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.
- C. Store materials at building site under cover in dry location

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: **C.R. Laurence Co., Inc. (CRL)**
Tel: (800) 421-6144 Fax: (800) 587-7501
Email: railings@crlaurence.com
www.crlaurence.com
- B. Manufacturers of equivalent products will be considered for substitution in accordance with provisions of Section 01 2500 - Product Substitution Procedures.

2.2 MATERIALS

- A. Aluminum Components: Conforming to ASTM B 221/ASTM B221M, Alloy 6063- T52
- B. Stainless Steel Components: Conforming to ASTM A 666, Type 304
- C. Brass Components: Conforming to ASTM B 248, No. 260, Yellow Brass

2.3 COMPONENTS

- A. Glazing: Fully tempered ASTM C 1048 Kind FT, Quality q3. As specified in Section 08 8000
 - 1. Monolithic Tempered Thickness: 5/8 inch (15 mm). (Architect to specify)
 - 2. Color: Clear
 - 3. Edge Condition: Eased
- B. Internal Handrail Cap Connection Sleeves: Metal tube, material compatible with handrail cap material.
- C. TAPER-LOC® Dry Glazing System: Each TAPER-LOC® Set consists of two Tapers, and one L-Setting Block. Designed for B5A, B5S, B5T, B6S, and B7S Shoe Bases. Patent Pending.
- D. Shoe Base:
 - 1. Profile: **CRL Part # B5S**; 2-1/2 inches (63.5 mm) wide by 4-1/8 inches (104.8 mm) high rectangular cross-section. Designed to work with CRL's TAPER-LOC® Dry Glazed System with 1/2" to 5/8" (12 to 16 mm) monolithic tempered glass.
 - 2. Material: Aluminum 6063-T52
 - 3. Finish:
 - a. Base Cladding: Sheet metal cladding added to exposed shoe base sections. Adhere with double-sided tape and/or silicone adhesive. Provide end caps where ends of shoe base sections are exposed.
 - b. 5052 Dark Bronze Anodized

- E. Metal Cap Railing:
 - 1. Profile: **Part # 636DU**, CRL-Blumcraft rectangular 1-3/4 inches x 4 inches (44.5 102 mm).
 - 2. Material: Anodized Aluminum.
 - 3. Finish: Dark Bronze
- F. Fasteners: Types and sizes indicated in shop drawings.
 - A. For concrete attachment, hole size in base shoe is to be 9/16" (14.3 mm), counter bore 7/8" (22.2 mm) x depth 1/2" (12.7 mm), center-to-center spacing of holes is 12" (304.8mm). Use Hilti HSL3 Expansion Anchors 3-3/4" (95 mm) long **CRL Part # EBA334**, Washer is included.
 - B. For steel attachment, hole size in base shoe is to be 9/16" (14.3 mm), counter bore 7/8" (22.2 mm) x depth 1/2" (12.7 mm), center-to-center spacing of holes is 12" (304.8mm). Use 1/2" – 13 x 1 stainless steel socket head cap screw **CRL Part # SHCS12X1**.
- G. Sill Angles for Tempered Glass Railing Assemblies: Steel angle profiles conforming to ASTM A 36, with anchoring devices, sizes indicated in shop drawing of section 05 5000, drilled and tapped for fastener types, sizes, and spacing indicated.

2.4 FABRICATION

- A. Fabricate handrail assembly components to lengths and configurations complying with shop drawings.
- B. Machine joint edges smooth and plane to produce hairline seams when site assembled; supply concealed sleeve connectors for joints.
- C. Isolate dissimilar metals to prevent electrolytic action by applying primer to concealed surfaces of metal components.

PART 3 INSTALLATION

3.1

- A. Install handrails in accordance with manufacturer's recommended installation instructions and approved shop drawings.

3.2 CLEANING

- A. Clean glazing surfaces after installation, complying with requirements contained in the manufacturer's instructions. Remove excess glazing sealant compounds, dirt or other substances.
- B. Remove protective films from metal surfaces.
- C. Clean railing surfaces with clean water and mild detergent. Do not use abrasive chemicals, detergents, or other implements that may mar or gouge the material.

3.3 PROTECTION

- A. Institute protective measures required throughout the remainder of the construction period to ensure that all the materials do not incur any damage or deterioration.

- B. Repair components damaged by subsequent construction activities in accordance with manufacturer's recommendations; replace damaged components that cannot be repaired to Architect's acceptance.

END OF SECTION

**SECTION 061000
ROUGH CARPENTRY**

<<<<< UPDATE NOTES

PART 1 GENERAL

2.01 SECTION INCLUDES

- A. Non-structural dimension lumber framing.
- B. Concealed wood blocking, nailers, and supports.
- C. Miscellaneous wood nailers, furring, and grounds.

2.02 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- B. AWPA U1 - Use Category System: User Specification for Treated Wood 2018.
- C. PS 20 - American Softwood Lumber Standard 2020.
- D. SPIB (GR) - Grading Rules 2014.

2.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.
- C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

2.04 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

3.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Southern Pine, unless otherwise indicated.
 - 2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.

3.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

3.03 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2. Anchors: Toggle bolt type for anchorage to hollow masonry.

3.04 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

PART 3 EXECUTION

4.01 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

4.02 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- D. Provide the following specific non-structural framing and blocking:
 1. Cabinets and shelf supports.
 2. Wall brackets.
 3. Grab bars.
 4. Chalkboards and marker board.
 5. Miscellaneous blocking.

4.03 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

4.04 CLEANING

- A. Waste Disposal: Comply with the requirements of Section 017419 - Construction Waste Management and Disposal.
 1. Comply with applicable regulations.
 2. Do not burn scrap on project site.
 3. Do not burn scraps that have been pressure treated.
 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION 061000

**SECTION 062000
FINISH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wood Planks for walls & ceilings.
- B. Wood Shelving & accessories.

1.02 RELATED REQUIREMENTS

- A. Section 095426 - Suspended Wood Ceilings
- B. Section 099300 - Staining and Transparent Finishing: Staining and transparent finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 4.0 2021.
- D. PS 1 - Structural Plywood 2009 (Revised 2019).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with plumbing rough-in, electrical rough-in, installation of associated and adjacent components, and A/V equipment.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Minimum Scale of Detail Drawings: 3/4" = 1'-0".
 - 2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- C. Samples: Submit two samples of wood plank 8 inch long.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.07 MOCK-UP

- A. Provide mock-up illustrating finish and construction.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.
- B. Protect work from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI (AWS) for Premium Grade.

- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.
- C. Interior Woodwork Items:
 - 1. Loose Shelving: Birch plywood; prepare for paint finish.
 - a. Accessories: Knap and Vogt standards and brackets
 - b. Material: steel
 - c. Finish: Black
 - d. Size: As indicated on drawings
 - 2. Tongue and Groove Linear Wood Planks (WD-2): Solid Wood.
 - a. Plank Thickness: 3/4 inch.
 - b. Plank Spacing (Reveal): Match Reveal C by ACGI.
 - c. Species: White Oak
 - d. Finish: stain to match Architect's sample

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.
- B. Provide sustainably harvested wood, certified or labeled as specified in Section 016000 - Product Requirements.
- C. Provide wood harvested within a 500 mile radius of the project site.
- D. Wood fabricated from timber recovered from riverbeds or otherwise abandoned is permitted, unless indicated otherwise, and provided it is clean and free of contamination, identify source; provide lumber re-graded by an inspection service accredited by the American Lumber Standard Committee, Inc. (ALSC).

2.03 SHEET MATERIALS

- A. Softwood Plywood Exposed to View: Face species white oak, plain sawn, medium density fiberboard core PS 1 Grade A-B, glue type as recommended for application.

2.04 FASTENINGS

- A. Concealed Joint Fasteners: Threaded steel.

2.05 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Lumber for Shimming and Blocking: Softwood lumber of [] species.
- C. Wood Filler: Solvent base, tinted to match surface finish color.

2.06 WOOD TREATMENT

- A. Fire Retardant Treatment (FR-S Type): Chemically treated and pressure impregnated; capable of providing flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84; [] manufactured by [].
- B. Provide identification on fire retardant treated material.
- C. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.
- D. Redry wood after pressure treatment to maximum [] percent moisture content.

2.07 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.08 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.

- C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
- D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:
 - a. System - 1, Lacquer, Nitrocellulose.
 - b. Sheen: Satin.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION 062000

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**SECTION 064100
ARCHITECTURAL WOOD CASEWORK**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Countertops.
- C. Hardware.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 123600 - Countertops.

1.03 REFERENCE STANDARDS

- A. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 4.0 2021.
- B. BHMA A156.9 - American National Standard for Cabinet Hardware 2015.
- C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood 2016.
- D. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1/4" to , minimum.
- C. Product Data: Provide data for hardware accessories.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
 - 2. Single Source Responsibility: Provide and install this work from single fabricator.

1.07 MOCK-UPS

- A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.
- B. Locate where directed.
- C. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.09 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Cabinets:
 - 1. Finish - Exposed Exterior Surfaces: Decorative laminate.
 - 2. Finish - Exposed Interior Surfaces: Decorative laminate.
 - 3. Finish - Semi-Exposed Surfaces: Decorative laminate
 - 4. Finish - Concealed Surfaces: Manufacturer's option.
 - 5. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
 - 6. Casework Construction Type: Type A - Frameless.
 - 7. Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.
 - 8. Grained Face Layout for Cabinet and Door Fronts: Flush panel.
 - a. Custom Grade: Doors, drawer fronts and false fronts wood grain to run and match vertically within each cabinet unit.
 - 9. Cabinet Design Series: As indicated on drawings.
 - 10. Cabinet Style: Flush overlay.
 - 11. Cabinet Doors and Drawer Fronts: Flush style.
 - 12. Drawer Construction Technique: As recommended by fabricator.

2.02 LAMINATE MATERIALS

- A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- B. Provide specific types as indicated.
 - 1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, through color, [_____] color, finish as indicated.
 - 2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, through color, [_____] color, finish as indicated.
 - 3. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.03 COUNTERTOPS

- A. Countertops: See Section 123600.

2.04 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Fasteners: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- D. Concealed Joint Fasteners: Threaded steel.
- E. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.05 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, satin chrome finish, for nominal 1 inch spacing adjustments.
- C. Fixed Specialty Shelf Supports:
 - 1. Material: Steel.
 - 2. Product: L80-7 double slotted stanchion system or equal.
 - 3. Manufacturer: Southwest Solutions Group.
- D. Fixed Specialty Workstation and Countertop Brackets:
 - 1. Material: Steel.

2. Finish: Manufacturer's standard, factory-applied powder coat.
3. Color: Selected by Architect from manufacturer's standard range.
4. Manufacturers:
 - a. A&M Hardware, Inc ; Concealed Brackets: <http://www.aandmhardware.com/#sle>.
- E. Drawer and Door Pulls (for use on PL-1 cabinets):
 1. Product: Cube pull manufactured by Hafele.
 2. Finish: Matte Black
 3. Size: 160 CTC
- F. Drawer and Door Handle(for use on PL-2):
 1. Product: Tab Collection manufactured by Hafele.
 2. Finish: Satin Aluminum
 3. Size: 152 mm.
- G. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, bronze with satin finish.
- H. Cabinet Catches and Latches:
- I. Drawer Slides:
 1. Type: Full extension.
 2. Static Load Capacity: Commercial grade.
 3. Mounting: Side mounted.
 4. Stops: Integral type.
 5. Features: Provide self closing/stay closed type.
- J. Hinges: European style concealed self-closing type, steel with satin finish.

2.06 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
 2. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- E. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.
- F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

- E. Secure cabinets to floor using appropriate angles and anchorages.
- F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION 064100

**SECTION 070553
FIRE AND SMOKE ASSEMBLY IDENTIFICATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.02 RELATED REQUIREMENTS

- A. Section 099123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

- A. Florida Building Code, Building (FBC-B), 5th Edition.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.
- C. Schedule: Completely define scope of proposed marking. Indicate location of affected walls and partitions, and number of markings.

1.05 FIELD CONDITIONS

- A. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Partition Identification Labels:
 - 1. Fire Wall Signs, Inc: www.firewallsigns.com.
 - 2. Safety Supply Warehouse, Inc: www.safetysupplywarehouse.com.

2.02 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

- A. Regulatory Requirements: Comply with "Markings and Identification" requirements of "Fire-Resistance Ratings for Fire Tests" chapter of the Florida Building Code (FBC-B).
- B. Adhered Fire and Smoke Assembly Identification Signs: Printed vinyl sign with factory applied adhesive backing.
- C. Languages: Provide all markings in English.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

- A. Install adhered markings in accordance with manufacturer's instructions.
- B. Install markings as required by Florida Building Code (FBC-B)
- C. Install neatly, with horizontal edges level.
- D. Protect from damage until Substantial Completion; repair or replace damaged markings.

END OF SECTION 070553

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**SECTION 071327
SELF-ADHERING SHEET WATERPROOFING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.02 SUMMARY

- A. The work of this section includes, but is not limited to, the following:
 - 1. Rubberized asphalt sheet membrane waterproofing system
 - 2. Prefabricated drainage composite
 - 3. Protection board
- B. Related Sections: Other specification sections which directly relate to the work of this section include, but are not limited to, the following:
 - 1. Section 033000 - Cast-In-Place Concrete
 - 2. Section 042000 - Unit Masonry
 - 3. Section 071100 - Dampproofing
 - 4. Section 076000 - Flashing and Sheet Metal
 - 5. Section 079200 - Joint Sealants
 - 6. Section 079500 - Expansion Control
 - 7. Section 334600 - Subdrainage

1.03 REFERENCE STANDARDS

- A. The following standards and publications are applicable to the extent referenced in the text.
- B. American Society for Testing and Materials (ASTM)
 - 1. Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
 - 2. Standard Test Methods for Rubber Properties in Tension
 - 3. Standard Test Method for Water Absorption of Plastics
 - 4. Standard Test Methods for Tensile Properties of Thin Plastic Sheeting
 - 5. Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
 - 6. D 1876 Standard Test Method for Peel Release of Adhesives (T-Peel)
 - 7. D 1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
 - 8. D 3767 Standard Practice for Rubber - Measurements of Dimensions
 - 9. D 5385 Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
 - 10. Standard Test Methods for Water Vapor Transmission of Materials
 - 11. Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations. Include certification of data indicating VOC (Volatile Organic Compound) content of all components of waterproofing system.
- B. Samples: Submit representative samples of the following for approval:
 - 1. Sheet membrane
 - 2. Protection board
 - 3. Prefabricated drainage composite

1.05 QUALITY ASSURANCE

- A. Manufacturer: Sheet membrane waterproofing system shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of self-adhesive sheet membrane waterproofing. Manufacturers proposed for use but not named in these

specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past 5 years.

- B. Installer: A firm which has at least 3 years experience in work of the type required by this section.
- C. Materials: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.
- D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer’s instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
 - 1. Do not double-stack pallets of membrane on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
 - 2. Protect mastic and adhesive from moisture and potential sources of ignition.
 - 3. Store drainage composite or protection board flat and off the ground. Provide cover on top and all sides.
 - 4. Protect surface conditioner from freezing.
 - 5. Sequence deliveries to avoid delays, but minimize on-site storage.

1.07 PROJECT CONDITIONS

- A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.
- B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

1.08 WARRANTY

- A. Sheet Membrane Waterproofing: Provide written 10 year labor and material warranty issued by the membrane manufacturer upon completion of the work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Sheet Membrane Waterproofing System: Bituthene® System 4000 Membrane by GCP Advanced technologies Construction Products; a self-adhesive, cold-applied composite sheet consisting of a thickness of 1.4 mm (0.056 in.) of rubberized asphalt and 0.1 mm (0.004 in.) of cross-laminated, high density polyethylene film specially formulated for use with water-based surface conditioner. Provide rubberized asphalt membrane covered with a release sheet which is removed during installation. No special adhesive or heat shall be required to form laps.
- B. Sheet Membrane Waterproofing

2.02 PHYSICAL PROPERTIES FOR BITUTHENE SYSTEM 4000 MEMBRANE:

PROPERTY	TEST METHOD	TYPICAL VALUE
COLOR		DARK GRAY-BLACK
THICKNESS	ASTM D 3767 METHOD A	1.5 MM (0.060 IN.) NOMINAL
FLEXIBILITY, 180° BEND OVER 25 MM (1 IN.) MANDREL AT -43°C (-45°F)	ASTM D 1970	UNAFFECTED
TENSILE STRENGTH, MEMBRANE DIE C	ASTM D 412 MODIFIED ¹	2240 KPA (325 LBS/IN. ²) MINIMUM

TENSILE STRENGTH, FILM	ASTM D 882 MODIFIED¹	34.5 MPA (5,000 LBS/IN.²) MINIMUM
ELONGATION, ULTIMATE FAILURE OF RUBBERIZED ASPHALT	ASTM D 412 MODIFIED¹	300% MINIMUM
CRACK CYCLING AT -32°C (-25°F), 100 CYCLES	ASTM C 836	UNAFFECTED
LAP ADHESION AT MINIMUM APPLICATION TEMPERATURE	ASTM D 1876 MODIFIED²	880 N/M (5 LBS/IN.)
PEEL STRENGTH	ASTM D 903 MODIFIED³	1576 N/M (9 LBS/IN.)
PUNCTURE RESISTANCE, MEMBRANE	ASTM E 154	222 N (50 LBS) MINIMUM
RESISTANCE TO HYDROSTATIC HEAD	ASTM D 5385	70 M (231 FT) OF WATER
PERMEANCE	ASTM E 96, SECTION 12 – WATER METHOD	2.9 NG/M²SPA(0.05 PERMS) MAXIMUM
WATER ABSORPTION	ASTM D 570	0.1% MAXIMUM

- A. Prefabricated Drainage Composite: Hydroduct® 220 Drainage Composite by GCP Advanced technologies Construction Products. Drainage Composite shall be designed to promote positive drainage while serving as a protection course.

2.03 ACCESSORIES

- A. Protection Board:
1. Expanded Polystyrene Protection Board: 25 mm (1 in.) thick for vertical applications with the following characteristics. Adhere to waterproofing membrane with Bituthene Protection Board Adhesive.
 - a. Normal Density: 16 kg/m³ (1.0 lb/ft³)
 - b. Thermal Conductivity, K factor: 0.24 at 5°C (40°F), 0.26 at 24°C (75°F)
 - c. Thermal Resistance, R-Value: 4 per 25 mm (1 in.) of thickness.
 2. Waterstop: Adcor™ ES hydrophilic non-bentonite waterstop by GCP Advanced technologies Construction Products for non-moving concrete construction joints.
 3. Miscellaneous Materials: Surface conditioner, mastic, liquid membrane, tape and accessories specified or acceptable to manufacturer of sheet membrane waterproofing.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. The installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSPECTION

- A. Contractor shall engage the services of a third party independent inspection company that has been trained for this purpose by GCP Applied Technologies. Successful inspection by a GCP Applied Technologies approved inspection firm is required for critical stages of the waterproofing installation including but not limited to:
1. After substrate preparation
 2. After membrane installation
 3. After installation of drainage composite
 4. During the placement of backfill

3.03 PREPARATION OF SUBSTRATES

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing.
- B. Cast-In-Place Concrete Substrates:
 - 1. Do not proceed with installation until concrete has properly cured and dried (minimum 7 days for normal structural concrete and minimum 14 days for lightweight structural concrete).
 - 2. Fill form tie rod holes with concrete and finish flush with surrounding surface.
 - 3. Repair bugholes over 13 mm (0.5 in.) in length and 6 mm (0.25 in.) deep and finish flush with surrounding surface.
 - 4. Remove scaling to sound, unaffected concrete and repair exposed area.
 - 5. Grind irregular construction joints to suitable flush surface.
- C. Masonry Substrates: Apply waterproofing over concrete block and brick with smooth trowel-cut mortar joints or parge coat.
- D. Wood Substrates: Apply waterproofing membrane over securely fastened sound surface. All joints and fasteners shall be flush to create a smooth surface.
- E. Related Materials: Treat joints and install flashing as recommended by waterproofing manufacturer.

3.04 INSTALLATION

- A. Refer to manufacturer's literature for recommendations on installation, including but not limited to, the following:
 - 1. Apply surface conditioner at rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of surface conditioner.
 - 2. Delay application of membrane until surface conditioner is completely dry. Dry time will vary with weather conditions.
 - 3. Seal daily terminations with troweled bead of mastic.
 - 4. Apply protection board and related materials in accordance with manufacturer's recommendations.

3.05 CLEANING AND PROTECTION

- A. Remove any masking materials after installation. Clean any stains on materials which would be exposed in the completed work.
- B. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.

END OF SECTION 071327

**SECTION 072100
THERMAL INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at exterior wall behind metal siding wall finish.
- B. Batt insulation in exterior wall construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

- A. Section 072700 - Air Barriers: Separate air barrier materials.

1.03 REFERENCE STANDARDS

- A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).
- B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board 2021.
- D. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings 2019.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- F. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C 2019a.
- G. ASTM E1414/E1414M - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum 2021a.
- H. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components 2019.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Insulation Over Metal Stud Framed Walls, Continuous: Polyisocyanurate board.
- B. Insulation in Metal Framed Walls: Batt insulation with separate vapor retarder.
- C. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
 - 1. Classifications:
 - a. Type II: Faced with either organic felt facers or glass fiber mat facers on both major surfaces of the core foam.

- 1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
- 2) Compressive Strength: Classes 1-2-3, Grade 1 - 16 psi (110 kPa), minimum.
- 3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48), minimum, at 75 degrees F.
2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
4. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
5. Board Size: 48 inch by 96 inch.
6. Board Thickness: 1.75 inch.
7. Products:
 - a. Atlas Roofing Corporation; EnergyShield CGF PRO: www.atlasroofing.com/#sle.

2.03 BATT INSULATION MATERIALS

- A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 4. Facing: Unfaced.
 5. Products:
 - a. CertainTeed Corporation; Insulpure: www.certainteed.com/#sle.
 - b. Johns Manville; Cavity-Shield: www.jm.com/#sle.
 - c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.

2.04 ACCESSORIES

- A. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
 1. Application: Sealing of interior circular penetrations, such as pipes or cables.
 2. Width: Are required for application.
- B. Insulation Fasteners: Lengths of unfinished, 13 gauge, 0.072 inch high carbon spring steel with chisel or mitered tips, held in place by tension, length to suit insulation thickness and substrate, capable of securely supporting insulation in place.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT EXTERIOR WALLS

- A. Adhere 6 inches wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
 1. Tape seal joints between sheets.
- B. Install boards horizontally on walls.
- C. Extend boards over expansion joints, unbonded to wall on one side of joint.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BATT INSTALLATION

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over face of member
- F. Tape seal tears or cuts in vapor retarder.
- G. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

3.04 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 072100

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EXTERIOR INSULATION AND FINISH SYSTEM WITH MOISTURE DRAINAGE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Exterior Insulation and Finish System (EIFS) with Moisture Drainage including:
 - a. An integral fluid applied air and water-resistive membrane barrier compatible with the substrate surface and adhesive application of the EIF system.
 - b. Accessory materials required for treating sheathing joints, fasteners, penetrations, rough openings, and material transitions compatible with substrate surfaces and the adhesive application of the EIF system.
 - c. Joint sealants compatible with specified EIFS for use in all exterior envelope joint waterproofing.

B. Related Requirements:

1. 03 30 00 Cast-in-place Concrete
2. 05 40 00 Cold-formed Metal Framing
3. 06 16 00 Sheathing
4. 07 25 00 Weather Air Barriers
5. 07 71 00 Roof Specialties
6. 07 92 00 Joint Sealants
7. 08 43 13 Aluminum Framed Storefronts
8. 08 44 13 Glazed Aluminum Curtain Walls

1.02 REFERENCES

A. Reference Standards:

1. ASTM Standards:
 - a. ASTM C 150 Standard Specification for Portland Cement
 - b. ASTM C 1063 Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement Plaster.
 - c. ASTM C 1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 - d. ASTM C 1382 Standard Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish Systems (EIFS) Joints
 - e. ASTM C 1397 Standard Practice for Application of Class PB Exterior Insulation and Finish System (EIFS) and EIFS with Drainage
 - f. ASTM D 3330 Standard Test Method for Peel Adhesion of Pressure-Sensitive Tape
 - g. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
 - h. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials
 - i. ASTM E 2098 Test Method for Determining the Tensile Breaking Strength of Glass Fiber Reinforcing Mesh for use in Class PB Exterior Insulation and Finish Systems (EIFS), after Exposure to Sodium Hydroxide Solution
 - j. ASTM E 2134 Test Method for Evaluating the Tensile-Adhesion Performance of Exterior Insulation and Finish Systems (EIFS)
 - k. ASTM E 2178 Standard Test Method for Air Permeance of Building Materials
 - l. ASTM E 2273 Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies
 - m. ASTM E 2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
 - n. ASTM E 2430 Standard Specification for Expanded Polystyrene (EPS) Thermal Insulation Boards for use in Exterior Insulation and Finish Systems (EIFS)

- o. ASTM E 2485 Standard Test Method for Freeze-Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water-Resistive Barrier Coatings
 - p. ASTM E 2486 Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS)
 - q. ASTM E 2568 Standard Specification for PB Exterior Insulation and Finish Systems
 - r. ASTM E 2570 Standard Test Method for Evaluating Water-Resistive Barrier (WRB) Coatings Used Under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage
2. National Fire Protection Association (NFPA) Standards:
- a. NFPA 268 Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Source
 - b. NFPA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load Bearing Wall Assemblies Containing Combustible Components

1.03 ADMINISTRATIVE REQUIREMENTS

A. Pre-Construction Meetings

1. The EIFS installer shall coordinate with the General Contractor to schedule, invite and administer a pre-construction meeting including but not limited to the architect of record, consultant(s), EIFS, sheathing board, accessory materials and sealant manufacturer's representatives and the owner to assure required integration of products selected as specified herein and for proper sequencing and installation detailing.

B. Coordinate for related specification and integration of Selected Materials as referenced in Section 2.02.B.1, 2.02.B.2 and 2.02.C herein below.

C. Sequencing

1. Provide jobsite grading prior to installation of Exterior Insulation and Finish System with Moisture Drainage so that the system may be terminated at 8 in above grade or as required by code.
2. Coordinate installation of sheathing board and accessory materials, flashing, foundation waterproofing, roofing membrane, windows, doors, and other penetrations of the exterior walls to provide a continuous air and water-resistive membrane barrier.
3. Provide protection of rough openings before installing windows, doors, and other penetrations of the exterior walls.
4. Coordinate installation of windows and doors so air and water-resistive membrane barrier accessory materials, transitions, flashings, etc. are connected to them to provide a continuous barrier.
5. Install window and door head flashings immediately after windows and doors are installed.
6. Install diverter flashings wherever water can enter the wall assembly to direct water to the exterior.
7. Install copings and sealants immediately after installation of the Exterior Insulation and Finish System with Moisture Drainage and when EIFS coatings are dry.
8. Attach penetrations through Exterior Insulation and Finish System to structural support and provide water-tight seals at penetrations.

1.04 ACTION SUBMITTALS / INFORMATIONAL SUBMITTALS

- A. Submit product data as required by Section 01 33 00, Administrative Requirements.
- B. Submit shop drawings for panelized EIFS with Moisture Drainage showing wall layout, connections, details, expansion joints, and installation sequence.
- C. Submit two (2) samples of the Exterior Insulation and Finish System with Moisture Drainage for each finish, texture, and color to be used on the project. Use the same tools and techniques proposed for the actual installation. Make the samples of sufficient size to accurately represent each color and texture being utilized on the project.
- D. Submit a current copy of the manufacturer's Trained Contractor Certificate for the EIF system specified. Submit Owner/Architect-requested test results verifying the performance of the Exterior Insulation and Finish System with Moisture Drainage.
- E. Submit a copy of the manufacturer's installation details and application instructions.

1.05 CLOSEOUT SUBMITTALS

- A. Submit a copy of the manufacturer's recommended maintenance and repair manual.
- B. Submit a copy of the Exterior Insulation and Finish System with Moisture Drainage manufacturer's comprehensive single source limited warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

- 1. A member in good standing of the EIFS Industry Members Association (EIMA).
- 2. Manufacture Exterior Insulation and Finish System with Moisture Drainage materials at a facility covered by a current ISO 9001:2015 and ISO 14001:2015 certification. Certification of the facility is done by a registrar accredited by the American National Standards Institute, Registrar Accreditation Board (ANSI-RAB).

B. Contractor Qualifications:

- 1. Knowledgeable in the proper installation of the Exterior Insulation and Finish System with Moisture Drainage.
- 2. Possess a current copy of the manufacturer's Trained Contractor Certificate for the EIF system specified.
- 3. Successfully complete a minimum of three (3) projects of similar scope and scale to the specified project.

C. Insulation Board Manufacturer Qualifications:

- 1. Listed by EIFS Manufacturer, and capable of producing the Expanded Polystyrene (EPS) in accordance with the current EIFS Manufacturer's Specification for Insulation Board.
- 2. Subscribe to the EIFS Manufacturer's Third Party Certification and Quality Assurance Program.

D. Panel Fabricator Qualifications:

- 1. Experienced and competent in the fabrication of architectural wall panels.

2. Possess a current Trained Contractor Certificate* issued by manufacturer.

E. Panel Erector Qualifications:

1. Experienced and competent in the installation of architectural wall panel EIF systems.
2. Shall be:
 - a. The panel fabricator or
 - b. An erector approved by the panel fabricator or
 - c. An erector under the direct supervision of the panel fabricator.

F. Mock-Up:

1. Provide the owner/architect with a mock-up for approval.
 - a. Of suitable size as required to accurately represent the products being installed, as well as each color and texture to be utilized on the project.
 - b. Prepared with the same products, tools, equipment and techniques required for the actual applications. Use finish from the same batch that is being used on the project.
 - c. Available and maintained at the jobsite.

G. Regulatory Requirements:

1. Separate the EPS insulation board from the interior of the building by a minimum 15-minute thermal barrier.
2. Comply with local building codes for the use and maximum thickness of EPS insulation board.

H. Inspections:

1. Cooperate with independent, third-party inspectors when required by code or by contract documents.

1.07 DELIVERY, STORAGE AND HANDLING

1. Deliver all Exterior Insulation and Finish System with Moisture Drainage components and materials to the job site in the original, unopened packages with labels intact.
2. Inspect all Exterior Insulation and Finish System with Moisture Drainage components and materials upon arrival for physical damage, freezing or overheating. Do not use questionable materials.
3. Store all Exterior Insulation and Finish System with Moisture Drainage components and materials at the jobsite in a cool, dry location, out of direct sunlight, protected from weather and other sources of damage. Maintain minimum and maximum storage temperature as stated in the product data sheets or specifications for the materials selected. **NOTE: Minimize exposure of materials to temperatures over 90 °F (32 °C). Finishes exposed to temperatures over the published maximum storage temperature for even short periods may exhibit skinning and increased viscosity and should be inspected prior to use.**
4. Protect all products from inclement weather and direct sunlight.

1.08 SITE CONDITIONS

A. Ambient Conditions

1. Do not apply wet materials during inclement weather unless appropriate protection is provided. Protect materials from inclement weather until they are completely dry.

2. Verify the minimum air and wall surface temperatures at the time of application as stated in the product data sheets or specifications for the materials selected.
3. Maintain these temperatures with adequate air ventilation and circulation for a minimum of 24 hours (48 hours for specific Specialty Finishes) thereafter, or until the products are completely dry.

1.09 WARRANTY

A. Manufacturers' Limited EIF System Warranty

1. Manufacturer shall offer a limited material defect and labor to repair or replace defective material warranty stating the Products will be free from manufacturing defect and will perform as warranted in the manner specified for the stated term measured from the Date of Project Substantial Completion.
 - a. A pre-construction meeting, including representatives of the Manufacturer, the Applicator, the Owner, and the Consultant (if applicable), shall be required prior to installation of the Products.
 - b. The warranty is available upon written request.
2. The EIF system warranty shall additionally include the following for the term of the warranty or as specifically noted hereunder.
 - a. The EIF system warranty term shall be 8 years.
 - b. The EIFS will drain incidental moisture between the air/water-resistive barrier and the insulation board.
 - 1) Remedy includes repair or replacement of any sheathing or framing member that is damaged as a result of the EIF system failing to drain incidental moisture between the secondary weather barrier and the insulation board.
 - c. Finish will be UV fade resistant for 10 years, except for specially produced colors.
 - 1) Specially produced colors will be UV fade resistant for 5 years when high-performance colorants are used to formulate.
 - d. The EIFS shall be eligible to receive a renewal of the original warranty if the Owner satisfactorily completes the specific renovation requirements published by the Manufacturer.

B. Installer Warranty

1. EIF system Installer shall provide a separate minimum 1-year warranty for all workmanship related to the proper installation and drainage performance of the EIFS application. Manufacturer shall not be responsible for workmanship associated with the installation of Exterior Insulation and Finish System with Moisture Drainage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design:

1. Dryvit Systems, Inc., One Energy Way, West Warwick, RI 02893, 800-556-7752, www.dryvit.com.
2. Tremco, Inc., 3735 Green Road Beachwood, OH 44122 [800.321.7906](tel:800.321.7906), www.tremco.com.

B. Substitution Limitations:

1. All components of the Outsulation® Plus MD System® including EPS Insulation Board shall be supplied or obtained from Dryvit Systems, Inc., Tremco, Inc. or their authorized distributors. Substitutions or additions of materials manufactured or supplied by others will void the EIF system warranty.
2. Alternate EIFS manufacturers must demonstrate equivalency for all elements of EIF system such as but not limited to:
 - a. Material components, compatibility and testing
 - b. Standard and specialty finishes;

- c. Color and texture matching; and,
 - d. Warranty criteria as specified herein.
3. Submit alternate EIFS manufacturer's complete data highlighting equivalency for review through Substitution Requirements as defined in Division 1.

2.02 DESCRIPTION

A. System Description:

1. The Dryvit Outsulation Plus MD System is an Exterior Insulation and Finish System (EIFS) with Moisture Drainage, consisting of:
 - a. An Air and Water-Resistive Membrane Barrier
 - b. Accessory Materials
 - c. Adhesive – installed in vertical ribbons to facilitate egress of incidental moisture
 - d. Expanded Polystyrene (EPS) insulation board
 - e. Base Coat
 - f. Reinforcing Mesh
 - g. Finish Coat
 - h. Joint Sealants as specified herein below

B. Materials:

1. Fluid-Applied Air and Water-Resistive Barrier:
 - a. Permeable:
 - 1) Dryvit Backstop® NT: A standard film vapor permeable, flexible, polymer-based non-cementitious water-resistive and air barrier coating available in Texture, Smooth, and spray versions. Backstop NT can be exposed for up to 6 months during the construction process. Backstop NT Texture is additionally used for treatment of sheathing board joints, inside / outside corners and spotting of fastener heads.
2. Accessory Materials for Fluid Applied Air and Water-Resistive Barrier:
 - a. Provide compatible accessory materials as required by project conditions for substrate, rough opening and penetration preparation, bridge expansion joints in substrate, material transitions and flashing integration to produce a complete air and water-resistant assembly.
 - 1) Dryvit Grid Tape™: An open weave fiberglass mesh tape with pressure sensitive adhesive. Used in combination with Backstop NT Texture for treating sheathing board joints and inside / outside corners and preparing rough openings and penetrations. Backstop NT Texture is used alone for spotting fastener heads.
 - 2) Dryvit AquaFlash®: Fluid-applied, water-based polymer transition membrane. Used in preparing rough openings and penetrations, bridging expansion joints in substrate, material transitions and flashing integration.
 - i. Dryvit AquaFlash Mesh and Corners: Polyester reinforcing mesh for use with AquaFlash.
 - 3) Dryvit Backstop Flash and Fill: A flexible, waterproof, low temperature gun applied material. Used in substrate preparation, treating sheathing board joints, inside/outside corners and fastener heads, preparing rough openings and penetrations, bridging expansion joints in substrate material transitions and flashing integration. Surface and ambient temperatures for application of Backstop Flash & Fill shall be between 32 °F (0 °C) and 110 °F (43 °C) for proper curing and drying of the material.

3. Drainage Components:

- a. Drainage Track UV treated PVC “J” channel perforated with weep holes, complying with ASTM D 1784 and ASTM C 1063.
- b. Acceptable manufacturers of Drainage Track:
 - 1) Starter Trac STWP – without drip edge by Plastic Components, Inc.
 - 2) Starter Trac STDE – with drip edge by Plastic Components, Inc.
 - 3) Universal Starter Track by Wind-lock Corporation
 - 4) Sloped Starter Strip with Drip by Vinyl Corp.
- c. Dryvit Drainage Strip™ corrugated plastic strip.
- d. Dryvit AP Adhesive™ urethane-based adhesive used to attach Drainage Track and Dryvit Drainage Strip to the sheathing.

4. Adhesives:

- a. Liquid polymer-based adhesive field mixed with Portland cement.
 - 1) Dryvit Primus®

5. Insulation Board:

- a. Expanded Polystyrene; minimum thickness 50 mm (2 in); meeting Dryvit Specification [DS131](#) and ASTM E 2430.

6. Pre-Coated Insulation Starter Boards, Corners and Shapes:

- a. Machine Coated Starter Boards, Corners and Shapes: Shall be produced with materials approved by Dryvit Systems, Inc. and be supplied by a fabricator approved by Dryvit Systems, Inc.

7. Base Coat:

- a. Liquid polymer-based base coat field mixed with Portland cement.
 - 1) Dryvit Primus

8. Reinforcing Mesh:

- a. Open-weave, glass fiber fabric treated for compatibility with other EIF system materials.
- b. Provide for ultra high impact mesh assembly including **Panzer 15 mesh** for all EIFS clad wall areas within 8'-0" of grade and where additionally indicated on contract drawings.

Reinforcing Mesh ¹ /Weight oz/yd ² (g/m ²)	Minimum Tensile Strengths	EIMA Impact Classificatio n	EIMA Impact Range		Impact Test Results	
			in-lbs	(Joules)	in-lbs	(Joules)
Standard - 4.3 (146)	150 lbs/in (27 g/cm)	Standard	25-49	(3-6)	36	(4)
Standard Plus - 6 (203)	200 lbs/in (36 g/cm)	Medium	50-89	(6-10)	56	(6)
Intermediate™ - 12 (407)	300 lbs/in (54 g/cm)	High	90-150	(10-17)	108	(12)
Panzer® 15 ¹ - 15 (509)	400 lbs/in (71 g/cm)	Ultra High	>150	(>17)	162	(18)
Panzer 20 ¹ - 20.5 (695)	550 lbs/in (98 g/cm)	Ultra High	>150	(>17)	352	(40)
Detail Mesh® Short Rolls - 4.3 (146)	150 lbs/in (27 g/cm)	n/a	n/a	n/a	n/a	n/a
Corner Mesh™ - 7.2 (244)	274 lbs/in (49 g/cm)	n/a	n/a	n/a	n/a	n/a

* It shall be colored blue and bear the Dryvit logo for product identification

1. Shall be used in conjunction with Standard Mesh (recommended for areas exposed to high traffic)

9. Finish:

- a. Water-based, acrylic coating with integral color and texture; formulated with Dirt Pickup Resistance (DPR) chemistry.
 - 1) Available textures:
 - a) Sandpebble® Fine – fine pebble texture

C. Joint Sealants:

- a. Seal control and expansion joints within the field of exterior finish and insulation system, using procedures recommended by sealant and finish system manufacturers.

D. Jobsite-Mixed Materials:

- 1. Portland cement: verify is Type I or II, meeting ASTM C 150, white or gray in color, fresh and free of lumps.
- 2. Water: verify is clean and free of foreign matter.

E. Reference Documentation for Outsulation Plus MD System:

- 1. Data Sheet – DS929
- 2. Details – DS944
- 3. Application Instructions – DS934

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:

- 1. Verify access to electric power, clean water and a clean work area at the location where the Dryvit materials are to be applied.
- 2. Verify the deflection of the substrate does not exceed 1/240 times the span. Verify substrate is flat within 1/4 in (6.4 mm) in a 4 ft (1.2 m) radius.
- 3. Verify substrate is sound, dry, connections are tight; has no surface voids, projections, or other conditions that may interfere with the Exterior Insulation and Finish System with moisture drainage installation or performance.
- 4. Verify the slope of inclined surfaces are not less than 6:12 (27 °) were the length of the slope does not exceed 12 in (305 mm) or 3:12 (14 °) were the length of the slope does not exceed 4 in (102 mm).
- 5. Verify metal roof flashings have been installed in accordance with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) standards.
- 6. Verify all rough openings are flashed in accordance with the Exterior Insulation and Finish System with Moisture Drainage manufacturer's installation details, or as otherwise necessary to prevent water penetration. Verify chimneys, balconies and decks have been properly flashed as necessary to prevent water penetration.
- 7. Verify windows and doors are installed and flashed per manufacturer's requirements and installation details.

8. Notify general contractor of all discrepancies prior to the installation of the Exterior Insulation and Finish System with moisture drainage.
9. Verify that expansion joints are installed:
 - a. Where expansion joints occur in the substrate system.
 - b. Where building expansion joints occur.
 - c. At floor lines in wood frame construction.
 - d. At floor lines of non-wood framed buildings where significant movement is expected.
 - e. Where the Exterior Insulation and Finish System with moisture drainage abuts dissimilar materials.
 - f. Where the substrate type changes.
 - g. Where prefabricated panels abut one another.
 - h. In continuous elevations at intervals not exceeding 75 ft (23 m).
 - i. Where significant structural movement occurs, such as changes in roof line, building shape or structural system.

3.02 PREPARATION

- A. Protect the Exterior Insulation and Finish System with Moisture Drainage materials by permanent or temporary means from inclement weather and other sources of damage prior to, during, and following application until completely dry.
- B. Protect adjoining work and property during installation of the Exterior Insulation and Finish System with Moisture Drainage.
- C. Prepare the substrate to be free of foreign materials, such as oil, dust, dirt, form-release agents, efflorescence, paint, wax, water repellants, moisture, frost, and any other condition that may inhibit adhesion.

3.03 INSTALLATION

- A. Install the EIF system in accordance with ASTM C1397 and the Dryvit Outsulation Plus MD System Application Instructions, DS934. Apply base coat sufficient to fully embed the reinforcing mesh. The recommended method is to apply the base coat in two (2) passes.
- B. Apply sealant to base coat surface prepared in accordance with [DS153](#).
- C. Install high impact reinforcing mesh as specified at ground level, high traffic areas and other areas exposed to or susceptible to impact damage as designated on contract drawings.
- D. Install Machine Coated Dryvit EPS Shapes in accordance with Dryvit Publication [DS854](#).

3.04 SITE QUALITY CONTROL

- A. EIFS sub-contractor to certify in writing the quality of work performed relative to the substrate system, details, installation procedures, and as to the specific products used.

3.05 CLEANING

- A. Remove all excess Exterior Insulation and Finish System materials from the job site by the contractor in accordance with contract provisions and as required by applicable law.
- B. Leave all surrounding areas, where the Exterior Insulation and Finish System with Moisture Drainage has been applied, free of debris and foreign substances resulting from the EIFS sub-contractor's work.
- C. Protect completed work from damage, soiling, and discoloration for duration of project.

**SECTION 072500
WEATHER BARRIERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fluid applied vapor-permeable, membrane air and water barrier.

1.02 RELATED REQUIREMENTS

- A. Section 092116 - Gypsum Board Assemblies: Water-resistive barrier under exterior cladding.

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.
- B. AATCC Test Method 127 - Test Method for Water Resistance: Hydrostatic Pressure 2018, with Editorial Revision (2019).
- C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection 2020.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- F. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials 2021a.
- G. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers 2016, with Editorial Revision (2019).
- H. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials 2017.
- I. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing 2015.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Manufacturer's Installation Instructions: Indicate preparation.

1.05 QUALITY ASSURANCE

- A. Materials shall be manufactured at a facility covered by a current ISO 9001:2015 and ISO 14001:2015 certification. Certification of the facility shall be done by a registrar accredited by the American National Standards Institute, Registrar Accreditation Board (ANSI-RAB).
- B. Contractor: Shall be experienced and competent in the waterproofing trade and application of liquid air and water-resistive barriers.

1.06 MOCK-UP

- A. Install air and water resistive barrier materials in mock-up at a location indicated by the architect.

1.07 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

- A. Air and Water-Resistive Barrier: Provide on exterior walls under exterior cladding.

2.02 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

- A. Air and Water Barrier, Fluid Applied: Vapor permeable, polymer based air / water resistive barrier.
 - 1. Air Barrier Coating:
 - a. Material: Flexible, polymer based, non-cementitious.
 - b. Acceptable Substrates: Stated by manufacturer as suitable for installation on visibly damp surfaces and concrete that has hardened but is not fully cured ("green" concrete) without requiring a primer.
 - c. Adhesion to Paper and Glass Mat Faced Sheathing: Sufficient to ensure failure due to delamination of sheathing.
 - d. Dry Film Thickness (DFT): 10 mil, 0.010 inch, minimum.
 - e. Air Permeance: 0.0001 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
 - f. Water Vapor Permeance: 7 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
 - g. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to six months of weather exposure after application.
 - h. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - i. Code Acceptance: Comply with applicable requirements of ICC-ES AC212.
 - j. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
 - k. Manufacturers:
 - 1) (Basis of Design) Dryvit Systems, Backstop NT..
 - 2) Substitutions: See Section 016000 - Product Requirements.

2.03 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.
- B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
 - 1. Composition: Modified bituminous sheet laminated to polyethylene sheet.
 - 2. Thickness: 20 mil, 0.020 inch, nominal; exception from ASTM D1970/D1970M.
- C. Pre-formed Transition Membrane: Semi-rigid silicone or polyester composition, tapered edges, tear resistant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Coatings:
 - 1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
 - 2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors air tight.
 - 3. Use flashing to seal to adjacent construction and to bridge joints.
- C. Openings and Penetrations in Exterior Weather Barriers:

1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Coordination of ABAA Tests and Inspections:
 1. Provide testing and inspection required by ABAA QAP.
 2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
 3. Cooperate with ABAA testing agency.
 4. Allow access to air barrier work areas and staging.
 5. Do not cover air barrier work until tested, inspected, and accepted.
- C. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- D. Take digital photographs of each portion of the installation prior to covering up.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION 072500

**SECTION 074213
METAL WALL PANELS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Horizontal Ribbed Wall Panels.

1.02 RELATED REQUIREMENTS

- A. Section 072100 - Thermal Insulation.
- B. Section 072500 - Weather Barriers: Water-resistive barrier under wall panels.
- C. Section 072700 - Air Barriers: Air barrier under wall panels.
- D. Section 079200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.03 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2021.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage.
- B. Samples: Submit two samples of wall panel and soffit panel, 4 inch by 4 inch in size illustrating finish color, sheen, and texture.
- C. Installer's qualification statement.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
- B. Installer Qualifications: Company specializing in installing products of the type specified in this section with minimum three years of documented experience.

1.06 MOCK-UPS

- A. Construct mock-up, 6 feet long by 4 feet wide; include panel system, glazing, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, related insulation in mock-up.
- B. Mock-up may remain as part of work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store prefabricated material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.
- C. Prevent contact with materials that may cause discoloration or staining of products.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
- C. Correct defective work within a five year period after Date of Substantial Completion, including defects in water tightness and integrity of seals for metal wall panels.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Metal Wall Panels - Exposed Fasteners:
 - 1. ATAS International, Inc; Belvedere 7.2 Inch Rib: www.atas.com/#sle.

2.02 METAL WALL PANEL MATERIALS

- A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
 - 1. Provide exterior panels.
 - 2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
 - 3. Maximum Allowable Deflection of Panel: $L/180$ for length(L) of span.
 - 4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
 - 5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
 - 6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
 - 7. Provide continuity of air barrier seal at building enclosure elements; see Section 072700.
- B. Exterior Wall Panels:
 - 1. Profile: Horizontal; BWR360.
 - 2. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
 - 3. Material: Precoated aluminum sheet, 20 gauge, 0.032 inch minimum thickness.
 - 4. Panel Width: 36 inches.
 - 5. Panel Depth: 1 1/2 inch
 - 6. Flame Spread Testing: ASTM E84
 - 7. Color: As selected by Architect from manufacturer's standard line.
 - 8. Texture: Smooth and Perforated (see drawings for locations)
- C. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.
- D. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
 - 1. Provide elite trim profiles for Horizontal Exterior Wall Panels as follows:
 - a. Endwall Channel
 - b. Reveal Extrusion
 - c. Base Extrusion
 - d. Head Extrusion
 - e. Jamb Extrusion
- E. Anchors: Aluminum or Stainless steel.

2.03 MATERIALS

- A. Precoated Aluminum Sheet: ASTM B209/B209M, 3105 alloy, O temper, smooth surface texture; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.04 FINISHES

- A. Exposed Surface Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, top coat over epoxy primer.
- B. Panel Backside Finish: Panel manufacturer's standard siliconized polyester wash coat.

2.05 ACCESSORIES

- A. Concealed Sealants: Non-curing butyl sealant or tape sealant.
- B. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
- C. Fasteners: Manufacturer's standard type to suit application;with soft neoprene washers, steel, hot dip galvanized.Fastener cap same color as exterior panel.

- D. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building framing members are ready to receive panels.
- B. Verify that air barrier has been installed over substrate completely and correctly; see Section 072700.

3.02 INSTALLATION

- A. Install panels on walls and soffits in accordance with manufacturer's instructions.
- B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
- C. Fasten panels to structural supports; aligned, level, and plumb.
- D. Locate joints over supports.
- E. Provide expansion joints where indicated.
- F. Use concealed fasteners unless otherwise approved by Architect.
- G. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.03 TOLERANCES

- A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
- B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.04 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION 074213

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074243
FIBER CEMENT CLADDING SYTEM

Part I - General

1.1 SECTION INCLUDES:

- A. Exterior, panelized fiber cement cladding system and accessories to complete a drained and back-ventilated rainscreen.
- B. Interior fiber cement panelized cladding system and accessories.

1.2 RELATED SECTIONS

- A. Section 05 41 00 - Structural Metal Stud Framing
- B. Section 06 10 00 - Rough Carpentry
- C. Section 06 16 00 - Sheathing
- D. Section 07 20 00 - Thermal Protection
- E. Section 07 25 00 - Weather Barriers
- F. Section 07 60 00 - Flashing and Sheet Metal
- G. Section 07 90 00 - Joint Protection

1.3 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 509-14 – Voluntary Test and Classification Method of Drained and Back Ventilated Rain Screen Wall Cladding Systems
- B. ASTM International (ASTM):
 - 1. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 2. ASTM C 1185 - Standard Test Methods for Sampling and Testing Non-Asbestos Fiber Cement.
 - a. ASTM C 1186 – Standard Specification for Flat Fiber-Cement Sheets.
 - 3. ASTM E-84 - Standard Test for Surface Burning Characteristics of Building Materials.
 - 4. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 5. ASTM E 228 - Standard Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer.
 - 6. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - 7. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- C. Florida Building Code - Test Protocol HVHZ
 - 1. Testing Application Standard (TAS) 202, 203 – HVHZ Test Procedures
- D. National Fire Protection Association (NFPA):
 - 1. NFPA 285 - Fire Test Method for Exterior Wall Assemblies Containing Combustible Material.

2. NFPA 268 – Ignition Resistance of Exterior Wall Assemblies.

E. Standards Council of Canada & Underwriters Laboratories Canada (ULC):

1. CAN/ULC S-102 – Standard Method of Test for Surface Burning Characteristics.

2. CAN/ULC S-134 – Standard Method of Fire Test of Exterior Wall Assembly.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Submit manufacturer's product description, storage and handling requirements, and installation instructions.

C. Product Test Reports and Code Compliance: Documents demonstrating product compliance with local building code, such as test reports or Evaluation Reports from qualified, independent testing agencies.

D. LEED Credits: Provide documentation of LEED Credits for project certification under USGBC LEED 2009 (Version 3.0) or 2012 v.4.

E. Manufacturer's Details: Submit drawings (.dwg, .rvt, and/or .pdf formats), including plans, sections, showing installation details that demonstrate product dimensions, edge/termination conditions/treatments, compression and control joints, corners, openings, and penetrations.

F. Samples: Submit samples of each product type proposed for use.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. All fiber cement panels specified in this section must be supplied by a manufacturer with a minimum of 10 years of experience in fabricating and supplying fiber cement cladding systems.

a. Products covered under this section are to be manufactured in an ISO 9001 certified facility.

2. Provide technical and design support as needed regarding installation requirements and warranty compliance provisions.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer trained by manufacturer or representative.

C. Mock-Up Wall: Provide a mock-up wall as evaluation tool for product and installation workmanship.

D. Pre-Installation Meetings: Prior to beginning installation, conduct conference to verify and discuss substrate conditions, manufacturer's installation instructions and warranty requirements, and project requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Panels must be stored flat and kept dry before installation. A waterproof cover over panels and accessories should be used at all times prior to installation. Do not stack pallets more than two high. Refer to the information included on each pallet.

B. If panels are exposed to water or water vapor prior to installation, allow to completely dry before installing. Failure to do so may result in panel shrinkage at ship lap joints, and such action may void warranty.

C. Panels MUST be carried on edge. Do not carry or lift panels flat. Improper handling may cause cracking or panel damage.

D. Direct contact between the panels and the ground should be avoided at all times. It is necessary to keep panels clean during installation process.

1.7 WARRANTY

A. Provide manufacturer's 15-year warranty against manufactured defects in fiber cement panels. Additional 5-year extension available when refinished in year 14-15.

B. Provide manufacturer's 15-year warranty against manufactured defects in panel finish.

PART II: PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Nichiha Corporation, 18-19 Nishiki 2-chome Naka-ku, Nagoya, Aichi 460-8610, Japan.

B. Acceptable Manufacturer's Representative: Nichiha USA, Inc., 6465 E. Johns Crossing, Suite 250, Johns Creek, GA 30097. Toll free: 1.866.424.4421, Office: 770.805.9466, Fax: 770.805.9467, www.nichiha.com.

1. Basis of Design Product: Nichiha VintageWood.

a. Profile colors: Cedar.

b. Profiles: Wood plank texture with three, 3/8" grooves running lengthwise, spaced 5-5/8" apart.

c. Accessory/Component Options:

i. Manufactured Corners with 3-1/2" returns for each profile color.

ii. Aluminum trim options: Corner Key, Open Outside Corner, H-Mold, J-Mold, Compression Joint, Inside Corner

1. Finish: Cedar

iii. Essential Flashing System: Starter, Overhang.

1. Finish: Matte black.

d. Dimensions:

1. AWP-3030: 455mm (17-7/8") (h) x 3,030 mm (119-5/16") (l).

e. Panel Thickness: 16 mm (5/8").

f. Weight: AWP-1818: 35.27 lbs. per panel, AWP-3030: 57.32 lbs. per panel.

g. Coverage: 8.88 sq. ft. per panel (1818), 14.81 sq. ft. per panel (3030).

h. Factory sealed on six [6] sides.

C. D. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 MATERIALS

A. Fiber cement panels manufactured from a pressed, stamped, and autoclaved mix of Portland cement, fly ash, silica, recycled rejects, and wood fiber bundles.

B. Panel surface pre-finished and machine applied.

C. Panels profiled along 3030mm edges so that the long joints between the installed panels are ship-lapped.

D. Factory-applied sealant gasket added to top panel edge; all 3030mm edge joints contain a factory sealant.

2.3 PERFORMANCE REQUIREMENTS:

A. Fiber Cement Cladding – Must comply with ASTM C-1186, Type A, Grade II requirements:

1. Wet Flexural Strength: Result: 1418 psi, Lower Limit: 1015 psi.

2. Water Tightness: No water droplets observed on any specimen.

3. Freeze-thaw: No damage or defects observed.

4. Warm Water: No evidence of cracking, delamination, swelling, or other defects observed.

5. Heat-Rain: No crazing, cracking, or other deleterious effects, surface or joint changes observed in any specimen.

B. Mean Coefficient of Linear Thermal Expansion (ASTM E-228): Max 1.0×10^{-5} in./in. F.

C. Surface Burning (CAN-ULC S102/ASTM E-84): Flame Spread: 0, Smoke Developed: 0.

D. Wind Load (ASTM E-330): Contact manufacturer for ultimate test pressure data corresponding to framing type, dimensions, fastener type, and attachment clips. Project engineer(s) must determine Zone 4 and 5 design pressures based on project specifics.

1. Minimum lateral deflection: L/120.

E. Water Penetration (ASTM E-331): No water leakage observed into wall cavity.

F. Steady-State Heat Flux and Thermal Transmission Properties Test (ASTM C-518): 16mm thick panel thermal resistance R Value of 0.47.

G. Fire Resistant (ASTM E-119): The wall assembly must successfully endure 60-minute fire exposure without developing excessive unexposed surface temperature or allowing flaming on the unexposed side of the assembly.

H. Ignition Resistance (NFPA 268): No sustained flaming of panels, assembly when subjected to a minimum radiant heat flux of $12.5 \text{ kW/m}^2 \pm 5\%$ in the presence of a pilot ignition source for a 20-minute period.

I. Drained and Back Ventilated Rainscreen (AAMA 509-14): System classifications: W1, V1.

J. Florida Building Code - Test Protocol HVHZ (TAS 202, 203): Horizontal Application Design Pressure: 95 psf, Vertical Application Design Pressure: 85 psf.

2.4 INSTALLATION COMPONENTS

A. Ultimate Clip System:

1. Starter Track:

- a. Horizontal Panel Installations - FA 700 – 3,030mm (l) galvalume coated steel.
- b. Vertical Panel Installations (AWP-3030 only) – FA 710T – 3,030mm (l) galvalume coated steel.

2. Panel Clips: JEL 778 “Ultimate Clip II” (10mm rainscreen for 16mm AWP) – Zinc-Aluminum-Magnesium alloy coated steel.

- a. Joint Tab Attachments (included) – used at all AWP-1818 panel to panel vertical joints, NOT used with AWP-3030 installations.

3. Corner Clips: JE 777C (10mm rainscreen for 5/8” AWP Manufactured Corners) -- Zinc-Aluminum-Magnesium alloy coated steel.

4. Single Flange Sealant Backer – FHK 1015 R (10mm) – 6.5’ (l) fluorine coated galvalume.
5. Double Flange Sealant Backer – FH 1015 R (10mm) – 10’ (l) fluorine coated galvalume.
6. Corrugated Spacer – FS 1005 (5mm), FS 1010 (10mm) – 4’ (l).

B. Aluminum Trim (optional): Paint primed trim as specified in finish schedule.

C. Essential Flashing System (optional):

1. Starter – main segments (3,030mm), inside corners, outside corners
2. Overhang – main segments (3,030mm), inside corners, outside corners, joint clips

D. Fasteners: Corrosion resistant fasteners, such as hot-dipped galvanized screws appropriate to local building codes and practices must be used. Use Stainless Steel fasteners in high humidity and high-moisture regions. Panel manufacturer is not liable for corrosion resistance of fasteners. Do not use aluminum fasteners, staples or fasteners that are not rated or designed for intended use. See manufacturer’s instructions for appropriate fasteners for construction method used.

E. Flashing: Flash all areas specified in manufacturer’s instructions. Do not use raw aluminum flashing. Flashing must be galvanized, anodized, or PVC coated.

F. Sealant: Sealant shall comply with ASTM C920, Class 35.

PART III: EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Fiber cement panels can be installed over braced wood, steel studs and sheathing including plywood, OSB, plastic foam (1” or less) or fiberboard sheathing. Fiber cement panels can also be installed over Structural Insulated Panels (SIP’s), Concrete Masonry Units (CMU’s) and Concrete

Block Structures (CBS's) with furring strips, and Pre-Engineered Metal Construction. Insulated Concrete Forms (ICFs) require added measures. Consult with Nichiha Technical Services.

2. Allowable stud spacing: 16" o.c. maximum.

3. A weather resistive barrier is required when installing fiber cement panels. Use an approved weather resistive barrier (WRB) as defined by the 2015 IBC or IRC. Refer to local building codes.

4. Appropriate metal flashing should be used to prevent moisture penetration around all doors, windows, wall bottoms, material transitions and penetrations. Refer to local building codes for best practices.

B. Examine site to ensure substrate conditions are within alignment tolerances for proper installation.

C. Do not begin installation until unacceptable conditions have been corrected.

D. Do not install panels or components that appear to be damaged or defective. Do not install wet panels.

3.2 TOLERANCE

A. Wall surface plane must be plumb and level within +/- ¼ inch in 20 feet in any direction.

1. One layer of Nichiha 5mm (~3/16") Spacer may be used as shim.

3.3 INSTALLATION

A. General: Install products in accordance with the latest installation guidelines of the manufacturer and all applicable building codes and other laws, rules, regulations and ordinances. Review all manufacturer installation, maintenance instructions, and other applicable documents before installation.

1. Consult with your local dealer or Nichiha Technical Department before installing any Nichiha fiber cement product on a building higher than 45 feet or three stories or for conditions not matching prescribed standard installation guide requirements and methods. A **Technical Design Review (TDR)** process is available to evaluate project feasibility.

2. **Vertical Control/Expansion Joints** are required with AWP-1818, for walls wider than 30 feet, within 2-12 feet of outside corners finished with metal trim *and* approximately every 30 feet thereafter.

A. **Vertical Control/Expansion Joints** are required at each AWP-3030 vertical joint, or H-Mold trim may be used instead.

3. **Horizontal/Compression Joints** are required for multi-story installations of AWP. Locate joints at floor lines. Joints are flashed minimum ½" breaks. Do not caulk. Refer to installation guide(s).

A. Wood framed buildings of three or more floors require a compression joint at each floor.

B. Steel framed buildings (including reinforced concrete core with LGMF exterior walls) of more than three floors (or 45 feet) require a compression joint every 25 feet at a floor line.

B. Panel Cutting

1. Always cut fiber cement panels outside or in a well ventilated area. Do not cut the products in an enclosed area.
2. Always wear safety glasses and NIOSH/OSHA approved respirator whenever cutting, drilling, sawing, sanding or abrading the products. Refer to manufacturer SDS for more information.
3. Use a dust-reducing circular saw with a diamond-tipped or carbide-tipped blade.
 - a. Recommended circular saw: Makita 7-1/4" Circular Saw with Dust Collector (#5057KB).
 - b. Recommended blade: Tenryu Board-Pro Plus PCD Blade (#BP-18505).
 - c. Shears (electric or pneumatic) or jig saw can be used for complicated cuttings, such as service openings, curves, radii and scrollwork.
4. **Silica Dust Warning:** Fiber cement products may contain some amounts of crystalline silica, a naturally occurring, potentially hazardous mineral when airborne in dust form. Consult product SDS or visit <https://www.osha.gov/dsg/topics/silicacrystalline/>.
5. Immediately clean dust from cut panels as it may bind to the finish.

3.4 CLEANING AND MAINTENANCE

- A. Review manufacturer guidelines for detailed care instructions.

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**SECTION 075419
POLYVINYL-CHLORIDE ROOFING**

PART 1 GENERAL

1.01 SECTION INCLUDES:

- A. Preparation of Substrate to Receive Roofing Materials
- B. Base Sheet or Roof Insulation Application to Prepared Substrate
- C. Roof Membrane Application
- D. Roof Flashing Application
- E. Incorporation of Sheet Metal Flashing Components and Roofing Accessories into the Roof System

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Sheet Metal Flashing and Trim
- B. Sheet Metal Roofing Specialties

1.03 RELATED SECTIONS

- A. Section [----] - Rough Carpentry
- B. Section [----] - Roof Decks
- C. Section [----] - Sheet Metal Flashing and Trim
- D. Section [----] - Sheet Metal Roofing Specialties

1.04 REFERENCE STANDARDS

REFERENCES IN THESE SPECIFICATIONS TO STANDARDS, TEST METHODS AND CODES, ARE IMPLIED TO MEAN THE LATEST EDITION OF EACH SUCH STANDARD ADOPTED. THE FOLLOWING IS AN ABBREVIATED LIST OF ASSOCIATIONS, INSTITUTIONS, AND SOCIETIES WHICH MAY BE USED AS REFERENCES THROUGHOUT THIS SPECIFICATION SECTION.

ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS PHILADELPHIA, PA
FM	FACTORY MUTUAL ENGINEERING AND RESEARCH NORWOOD, MA
NRCA	NATIONAL ROOFING CONTRACTORS ASSOCIATION ROSEMONT, IL
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION WASHINGTON, DC
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION CHANTILLY, VA
UL	UNDERWRITERS LABORATORIES NORTHBROOK, IL

1.05 DESCRIPTION OF WORK

THE BASIC WORK DESCRIPTIONS REQUIRED IN THIS SPECIFICATION ARE REFERENCED BELOW.

**PROJECT TYPE: NEW CONSTRUCTION
DECK: SLOPED METAL
MIN. SLOPE: ¼**

INSULATION (bottom layer): Paratherm rigid insulation providing for an R-value that is called out on the drawings, mechanically fastened with the top layer of insulation.

INSULATION (top layer): DensDeck Prime, having a thickness of ½ inch, mechanically fastned to approved fastening pattern.

**ROOF SYSTEM: PARADIENE 20 TG, TORCH APPLIED
80 MIL PARASOLO KEE FLEECEBACK ROOF MEMBRANE, APPLIED
IN PARAFAST T LOW RISE ADHESIVE.**

FLASING SYSTEM: 80 mil Parasolo KEE detailing membrane applied in bonding adhesive.

SUPPLEMENTAL FLASHING: Parapro 123 Flashing System

1.06 SUBMITTALS

ALL SUBMITTALS WHICH DO NOT CONFORM TO THE FOLLOWING REQUIREMENTS WILL BE REJECTED.

A. SUBMITTAL OF EQUALS: SUBMIT PRIMARY ROOF SYSTEMS TO BE CONSIDERED AS EQUALS TO THE SPECIFIED ROOF SYSTEM NO LESS THAN 10 DAYS PRIOR TO BID DATE. PRIMARY ROOF SYSTEMS WHICH HAVE BEEN REVIEWED AND ACCEPTED AS EQUALS TO THE SPECIFIED ROOF SYSTEM WILL BE LISTED IN AN ADDENDUM PRIOR TO BID DATE; ONLY THEN WILL EQUALS BE ACCEPTED AT BIDDING. SUBMITTALS SHALL INCLUDE THE FOLLOWING:

1. Two 3 inch x 5 inch samples of the primary roofing and flashing sheets.
2. Latest edition of the roofing system manufacturer's specifications and installation instructions.
3. Evidence that the manufacturer of the proposed roofing system utilizes a quality management system that is ISO 9001 certified. Documentation of ISO 9001 certification of foreign subsidiaries without domestic certification will not be accepted.
4. Evidence and description of manufacturer's quality control/quality assurance program for the primary roofing products supplied. The quality assurance program description shall include all methods of testing for physical and mechanical property values. Provide confirmation of manufacturer's certificate of analysis (COA) for reporting the tested values of the actual material being supplied for the project prior to issuance of the specified guarantee.
5. Descriptive list of the materials proposed for use.
6. Evidence of Underwriters' Laboratories Class A acceptance of the proposed roofing system (including mopping asphalt or cold adhesive) without additional requirements for gravel or coatings. No other testing agency approvals will be accepted.
7. Evidence that the roof configuration (including fastening of insulation) has been tested by an accredited independent testing agency to meet the design windload pressure indicated in Part 1.07 C2.
8. The roof membrane configuration shall be approved by FM for Class 1-SH (severe hail) exposure.
9. Complete list of material physical and mechanical properties for each sheet including: weights and thicknesses.
10. Sample copy of the proposed guarantee.

B. SUBMITTALS PRIOR TO CONTRACT AWARD:

1. Letter from the proposed primary roofing manufacturer confirming that the bidder is an acceptable Contractor authorized to install the proposed system.
2. Letter from the primary roofing manufacturer stating that the proposed application will comply with the manufacturer's requirements in order to qualify the project for the specified guarantee.

C. SUBMITTALS PRIOR TO PROJECT CLOSE-OUT:

1. Manufacturer's printed recommendations for proper maintenance of the specified roof system including inspection frequencies, penetration addition policies, temporary repairs, and leak call procedures.

1.07. QUALITY ASSURANCE

A. Acceptable Products: Primary roofing products, including each type of sheet, all manufactured in the United States, shall be supplied by a single manufacturer which has been successfully producing the specified types of primary products for not less than 10 years. The primary roofing products shall have maintained a consistent composition for a minimum of five years.

B. Product Quality Assurance Program: Primary roofing materials shall be manufactured under a quality management system that is monitored regularly by a third party auditor under the ISO 9001 audit process. A certificate of analysis (COA) for reporting/confirming the tested values of the actual material being supplied for the project will be required prior to project close-out.

C. Agency Approvals: The proposed roof system shall conform to the following requirements. No other testing agency approvals will be accepted.

1. Evidence by an accredited independent testing agency or agencies that the roof configuration meets a design windload pressure of – 67.5 psf or greater.

D. Acceptable Contractor: Contractor shall have a minimum of 2 years experience in successfully installing the same or similar roofing materials and be certified in writing by the roofing materials manufacturer to install the primary roofing products.

E. Scope of Work: The work to be performed under this specification shall include but is not limited to the following: Attend necessary job meetings and furnish competent and full time supervision, experienced roof mechanics, all materials, tools, and equipment necessary to complete, in an acceptable manner, the roof installation in accordance with this specification. Comply with the latest written application instructions of the manufacturer of the primary roofing products. In addition, application practice shall comply with requirements and recommendations contained in the latest edition of the National Roofing Contractor's Association (NRCA) Roofing Manual as published by the National Roofing Contractor's Association.

F. Local Regulations: Conform to regulations of public agencies, including any specific requirements of the city and/or state of jurisdiction.

G. Manufacturer Requirements: Ensure that the primary roofing materials manufacturer provides direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conducts a final inspection upon successful completion of the project.

1.08 PRODUCT DELIVERY STORAGE AND HANDLING

A. Delivery: Deliver materials in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.

B. Storage: Refer to the manufacturer's published literature for storage guidelines.

C. Handling: Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.

D. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above will be automatically rejected, removed and replaced at the Contractor's expense.

1.09 PROJECT/SITE CONDITIONS

A. Requirements Prior to Job Start

2. Notification: Give a minimum of 5 days notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.

3. Permits: Obtain all permits required by local agencies and pay all fees which may be required for the performance of the work.
 4. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.
- B. Environmental Requirements
5. Precipitation: Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.
 6. Temperature Restrictions - adhesive: Refer to the manufacturer's published guidelines for temperature restrictions for adhesive applications.
- C. Protection Requirements
7. Membrane Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.
 8. Limited Access: Prevent access by the public to materials, tools and equipment during the course of the project.
 9. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
 10. Site Condition: Complete, to the owner's satisfaction, all job site clean-up including building interior, exterior and landscaping where affected by the construction.

1.10 GUARANTEE/WARRANTY

- A. Roof Membrane Guarantee: Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the manufacturer's 25 year labor and materials membrane guarantee. The guarantee shall be a term type, without deductibles or limitations on coverage amount, and shall be issued at no additional cost to the Owner.
11. Basis of Design > Siplast 25-year Parasolo Roof Membrane/System Guarantee

PART 2 PRODUCTS

2.01 ROOFING SYSTEM ASSEMBLY/PRODUCTS

- A. Rigid Roof Insulation: Roof insulation shall be UL and FM approved. Insulation shall be approved in writing by the insulation manufacturer for intended use and for use with the specified roof assembly.
1. Polyisocyanurate: A closed cell, rigid polyisocyanurate foam core material, integrally laminated between glass fiber reinforced organic facers, in full compliance with ASTM C 1289, Type II, Class 1, Grade 2 (20 psi). Panels shall have a nominal thickness TBD on drawings. Acceptable types are as follows:
 - a. Basis of Design > Paratherm by Siplast; Irving, TX
 2. Gypsum Sheathing Panel: A panel composed of a gypsum based, non-structural water resistant core material integrally bonded with fiberglass mats on both sides having a nominal thickness of 1/4 inch. The panel surface shall be factory primed with a non-asphaltic primer. Acceptable types are as follows:
 - a. DensDeck Prime Gypsum Roof Board, by Georgia Pacific Corporation; Atlanta, GA

2.02 DESCRIPTION OF SYSTEMS

- B. Roof Membrane Ply (fleece-back): A roof membrane consisting of one ply of a prefabricated, polyester scrim-reinforced, polyvinyl chloride (PVC) membrane formulated with an Elvaloy® Ketone Ethylene Ester (KEE) copolymer, applied over a prepared substrate. The roof membrane shall have a factory-adhered polyester fleece backing on the bottom side. The roof membrane shall meet or exceed to the minimum criteria established by ASTM D4434 Standard Specification for Poly(Vinyl Chloride) Sheet Roofing (Type III). The minimum thickness of the roof membrane shall be 80 mils (1.52 mm), as established by ASTM D751 Standard Test Method for Coated Fabrics. The minimum thickness of the roof membrane over the

reinforcement scrim shall be 40 mils (0.685 mm), as established by ASTM D7635 Standard Test Method for Measurement of Thickness of Coatings Over Fabric Reinforcement.

1. Basis of Design > Siplast Parasolo PVC KEE Fleeceback roof system – 80 mil
- C. Flashing Ply (fleece-back): A roof membrane consisting of one ply of a prefabricated, polyester scrim-reinforced, polyvinyl chloride (PVC) membrane formulated with an Elvaloy® Ketone Ethylene Ester (KEE) copolymer, applied over a prepared substrate. The flashing membrane shall have a factory-adhered polyester fleece backing on the bottom side. The flashing system shall meet or exceed to the minimum criteria established by ASTM D4434 Standard Specification for Poly(Vinyl Chloride) Sheet Roofing (Type III). The minimum thickness of the flashing membrane shall be 80 mils as established by ASTM D751 Standard Test Method for Coated Fabrics. The minimum thickness of the flashing membrane over the reinforcement scrim shall be 40 mils as established by ASTM D7635 Standard Test Method for Measurement of Thickness of Coatings Over Fabric Reinforcement.
 1. Basis of Design > Siplast Parasolo PVC KEE smooth detailing membrane – 80 mil
- D. Catalyzed Acrylic Resin Flashing System: A specialty flashing system consisting of a liquid-applied, fully reinforced, multi-component acrylic membrane installed over a prepared or primed substrate. The flashing system consists of a catalyzed acrylic resin primer, basecoat and topcoat, combined with a non-woven polyester fleece. The resin and catalyst are pre-mixed immediately prior to installation. The use of the specialty flashing system shall be specifically approved in advance by the membrane manufacturer for each application.
 1. Basis of Design > Parapro 123 Flashing System by Siplast; Irving, TX
NOTE: Unistrut supports are not a suitable substrate for the Parapro 123 Flashing System. Any unistrut type penetration that is required to be incorporated into the roofing system should be replaced by a solid square or angle iron penetration with a fully welded plate.
- E. Substitute Systems: The following substitute systems shall be considered in lieu of the specified basis of design.
 1. 80 mil FiberTite-SM Fleeceback hybrid roof system by Seaman Corp., Wooster, OH
 2. 80 mil TremPly KEE Fleeceback hybrid roof system by Tremco Roofing and Building Maintenance, Beachwood, OH

2.03 ROOFING ACCESSORIES

- F. Roofing Membrane Adhesives
 1. Fleeceback PVC Membrane Adhesive: A two-part low-rise polyurethane foam adhesive designed for bonding fleece-backed PVC single-ply roofing membranes to various roofing substrates.
 - a. Basis of Design > Parafast T Adhesive by Siplast; Irving, TX
- G. Sealant: A solvent-based, UV resistant synthetic elastomeric sealant for the completion of details.
 1. Basis of Design > Parasolo Flexseal Caulk Grade by Siplast; Irving, TX
- H. Water Block: A single component butyl-based high viscosity sealant for sealing the flashing membrane to the substrate behind exposed termination bars, flashing boots, drain flanges.
 1. Basis of Design > Parasolo Water Block by Siplast; Irving, TX
- I. Membrane Conditioner/Cleaner: A solvent-based agent used to clean exposed or contaminated seams prior to heat welding to remove any residue that may compromise lap welding.
 1. Basis of Design > Parasolo Membrane Conditioner by Siplast; Irving, TX
- J. Membrane Flashing Accessories
 1. Cover Patches at T-Joints: A molded PVC membrane used to reinforce the T-joints of the specified PVC membrane system.
 - a. Basis of Design > Parasolo KEE T-Joint Cover Patch by Siplast; Irving, TX
 2. Pre-formed Boots: A molded PVC membrane used to flash pipe and conduit penetrations having a diameter of 1 to 6 inches (25 to 152 mm). The pre-formed boots shall be hot-air

- welded directly to the PVC roof membrane.
- a. Basis of Design > Parafast KEE Conical Pipe Boot by Siplast; Irving, TX
 3. Outside Corner Flashing: A molded PVC membrane designed to accommodate outside corners of base and curb flashing details. The molded flashing component shall be hot-air welded directly to the specified PVC membrane.
 - a. Basis of Design > Parasolo KEE Outside Corner by Siplast; Irving, TX
 4. Inside Corner Flashing: A molded PVC membrane designed to accommodate inside corners of base and curb flashing details. The molded flashing component shall be hot-air welded directly to the specified PVC membrane.
 - a. Basis of Design > Parasolo KEE Inside Corner by Siplast; Irving, TX
 5. Fluted Corner Flashing: A molded PVC membrane designed to accommodate corners of base and curb flashing details having dimensions that cannot be addressed using standard pre-formed PVC inside or outside corner flashing components. The molded flashing component shall be hot-air welded directly to the specified PVC membrane.
 - a. Basis of Design > Parasolo KEE Fluted Corner by Siplast; Irving, TX
 6. Flashing Strip: An 8-inch wide molded PVC membrane strip designed for general repairs, end laps, and to strip-in PVC coated metal flanges.
 - a. Basis of Design > Parasolo KEE Flashing Strip by Siplast; Irving, TX
 7. Termination Bar with Receiver: An extruded aluminum termination bar with rounded edges and an angled sealant receiver and lower leg bulb stiffener, having factory-punched, slotted holes spaced on 6-inch (152 mm) centers.
 - a. Basis of Design > Parafast Lip Termination Bar 6 inch On Center by Siplast; Irving, TX
 8. Termination Bar with Receiver: An extruded aluminum termination bar with rounded edges and an angled sealant receiver and lower leg bulb stiffener, having factory-punched, slotted holes spaced on 8-inch (203 mm) centers.
 - a. Basis of Design > Parafast Lip Termination Bar 8 inch On Center by Siplast; Irving, TX
 9. Flat Termination Bar: A flat, extruded aluminum termination bar with rounded edges, having factory-punched, slotted holes spaced on 6-inch (152 mm) centers.
 - a. Basis of Design > Parafast Flat Termination Bar 6 inch On Center by Siplast; Irving, TX
 10. Flat Termination Bar: A flat, extruded aluminum termination bar with rounded edges, having factory-punched, slotted holes spaced on 8-inch (203 mm) centers.
 - a. Basis of Design > Parafast Flat Termination Bar 8 inch On Center by Siplast; Irving, TX
 11. PVC Coated Metal: 4-foot by 10-foot sheets of 0.040 aluminum having a factory-laminated PVC coating, used for fabrication into metal gravel stop/drip edge components, base flashings, sealant pans, and scupper sleeves.
 - a. Basis of Design > Parafast PVC Coated Metal by Siplast; Irving, TX
- K. Fasteners
1. Insulation Fasteners: Insulation fasteners and plates shall be FM Approved, and/or approved by the manufacturer of the primary roofing products. The insulation fasteners shall provide attachment required to meet the specified uplift performance and to restrain the insulation panels against the potential for ridging. The fastening pattern for each insulation panel to be used shall be as recommended by the insulation manufacturer and approved by the manufacturer of the primary roofing products. Acceptable insulation fastener manufacturers for specific deck types are listed below.
 - a. Metal Decks: Insulation mechanical fasteners for wood/plywood decks shall be factory coated for corrosion resistance. The fastener shall conform meet or exceed Factory Mutual Standard 4470 and when subjected to 30 Kesternich cycles, show less than 15% red rust. Acceptable insulation fastener types for wood/plywood decks are listed below.

- 1) A fluorocarbon coated screw type roofing fastener having a minimum 0.220 inch thread diameter. Plates used in conjunction with the fastener shall be a metal type having a minimum 3 inch diameter, as supplied by the fastener manufacturer.
 - (a) Basis of Design > Parafast Fastener by Siplast; Irving, TX
- L. Walktread: A prefabricated, extruded and embossed PVC protection pad with a skid-resistant surface.
 1. Thickness: 1/8 inch (3.2 mm)
 2. Width: 30 in (76.2 cm)
 - a. Parasolo Walkway by Siplast; Irving, TX

PART 3 EXECUTION

PREPARATION

- A. General: Sweep or vacuum all surfaces, removing all loose aggregate and foreign substances prior to commencement of roofing.

3.02 ROOF MEMBRANE INSTALLATION

- B. Membrane Application: Apply roofing in accordance with roofing system manufacturer's instructions and the following requirements. Application of roofing membrane components shall immediately follow application of base sheet and/or insulation as a continuous operation.
- C. Aesthetic Considerations: Construction of an aesthetically pleasing overall appearance of the finished roof application is a standard requirement for this project. Make necessary preparations, utilize recommended application techniques, apply the specified materials and exercise care in ensuring that the finished application is acceptable to the Owner.
- D. Membrane Adhesive Application: Membrane adhesive can be applied by roller. Apply cold adhesive in a smooth, even, continuous layer without breaks or voids. Utilize an application rate as published by the roof membrane manufacturer.
- E. Roofing Application: Apply roofing to be free of wrinkles, creases or fishmouths. Use a blower and/or broom to remove any dirt or debris from the substrate surface.
 1. Unroll the specified fleece-back PVC sheets in place and fold back sheets in the long dimension to allow adhering of membrane, one half of sheet at a time. Alternatively, align a full roll of membrane with the factory-applied lap line on the previously installed sheet. Roll out the roll approximately 20 feet (6.1 m) checking to see that the edge of the new roll is straight with the line. Pick up the tail end of the previously rolled-out membrane and pull back over top of the roll of membrane.
 2. Apply the specified low-rise foam adhesive in a "spatter pattern" over the substrate to yield a heavily textured, even coating of approximately 1/4- inch (6.2 mm) to 1/2 inch (12 mm) nominal thickness height on the peaks of the spattered adhesive. Allow the adhesive to rise and apply the roof membrane before the adhesive begins to "skin" over.
 3. Lay half of the membrane into the wet adhesive and roll into place with a 150 lb. (68 kg) roller. Repeat the process for the other half of sheet. If following the alternative method, pull the sheet back to its original position, and roll into place. Make sure that the lap line is followed when re-installing the sheet.
 4. Where the substrate angle changes in excess of 5 degrees (i.e. 1-inch slope), mechanically attach the membrane into the structural deck on [6-inch, 12-inch] centers, keeping the fasteners 1/4 to 3/4 inches from the angle change. At curbs and walls where the angle changes in excess of 10 degrees (i.e. 2-inch slope), mechanically attach the membrane into the structural deck on [6-inch, 12-inch] centers, keeping the fasteners 1/2 inch from the membrane edge. Alternatively, at walls/curbs extend the membrane a minimum of 3 inches up the vertical flashing substrate and mechanically attach the specified lipped termination bar, inverted, at the top edge of the membrane. The termination bar must be installed within 1.5 to 2 inches (38 to 51 mm) of the horizontal plane of the roof, with a minimum of 1-inch (25 mm) of membrane extending above the termination bar. Prior to mechanical attachment of the termination bar, apply the specified

- water block sealant on the flashing substrate where the membrane will terminate. Apply the specified sealant at the top of the termination bar if left exposed.
5. Install a minimum of 4 fasteners evenly spaced around all round, square, "L"-beam or "H"-beam penetrations, keeping the fasteners 1/4 to 3/4 inches from the penetration. At penetrations having a larger diameter, install fasteners around the penetration on 12-inch centers.
 6. Clean the laps of membrane that has become dirty or contaminated using the specified conditioner. Heat weld all side and end laps of the membrane during each day's application. All welds must be continuous, without voids, and free of burns and scorch marks. Weld shall be a minimum width of 1.5 inches (38 mm) for automatic machine welding and 2 inches (51 mm) for hand welding. Contact the manufacturer of the heat-welding equipment for specific guidelines on operating the equipment. Hand-roll the side laps and head laps of the membrane behind the heat welder.
- F. Flashing Application - General: Locate all penetrations at least 24 inches from curbs, walls, and edges to provide access for proper application of the specified flashing materials. Reinforce all coated metal and membrane flashing corners using preformed corners or non-reinforced membrane. Hot-air weld all flashing membranes, accessories, and coated metal to have a minimum 2-inch (51 mm) hand-welded or minimum 1.5-inch (38 mm) automatic machine-welded lap. Reference the manufacturer's standard details for all flashing conditions.
- G. Flashing Application - Coated Metal Flashings: Form coated metal flashings in accordance with the manufacturer's published specifications. Reference the manufacturer's standard details for all flashing conditions. Gap joints of coated metal edge, and flashing sections by a 1/4-inch (6 mm) to allow for expansion and contraction. Apply 2-inch (51 mm) aluminum tape over the joint as a bond-breaker, to prevent welding in this area. Hot-air weld a 6-inch (152 mm) unsupported membrane flashing strip to both sides of the joint, with approximately 1-inch (25 mm) on either side of the joint left un-welded to allow for expansion and contraction. Lap all joints of coated metal sealant pans, scupper inserts, corners of roof edging and base flashing, or pop-rivet a separate metal piece to create a continuous flange condition. Hot-air weld a 6-inch (152 mm) strip of reinforced membrane flashing over all seams that will not be sealed during subsequent flashing installation.
- H. Catalyzed Acrylic Resin Flashing System: Install the liquid-applied primer and flashing system in accordance with the membrane system manufacturer's printed installer's guidelines and other applicable written recommendations as provided by the manufacturer.
- I. Water Cut-Off: At end of day's work, or when precipitation is imminent, construct a water cut-off at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.

3.03 ROOF SYSTEM INTERFACE WITH RELATED COMPONENTS

- J. Walkway/Protection Pads: Install walkway rolls at all roof access locations and other designated locations including roof-mounted equipment, work locations and areas of repeated rooftop traffic. Cut the walktread into maximum 5 foot lengths and allow to relax until flat. Use a minimum spacing of 2 inches between sheets to allow for proper drainage. Heat-weld the walkway rolls to provide a continuous bond around the perimeter edges of the sheet to the roof membrane surface.
- K. Roof Drains: Fit drains with clamping rings and strainer baskets. Provide a minimum 36-inch by 36-inch sump and a slope within the sump not exceeding 4:12. Extend the roof membrane over the drain opening and cut a hole in the membrane directly over the opening, leaving a 1/2-inch of membrane to extending past the drain flange into the drain opening. Punch holes through the roofing membrane at drain bolt locations. Set the membrane in a full bed (i.e. full tube) of the specified water block sealant over the drain flange prior to securement of the clamping ring. Lap seams within the sump area must be avoided. Where lap seams cannot be located outside of the sump area, apply a separate target of the specified roof membrane to extend a minimum of 12-inches in all directions from the sump area and mechanically attached

on 12-inch centers around the drain with the specified screws and plates. Heat weld the flashing target beyond the screws and plates, extending over the drain flange.

- L. Termination Bars: Prior to mechanical attachment of the termination bar, apply the specified water block sealant on the flashing substrate where the membrane will terminate. Mechanically attach termination bars using the specified fasteners. Apply a continuous bead of the specified sealant at the top of termination bars that are fabricated with a sealant receiver lip.

3.04 FIELD QUALITY CONTROL AND INSPECTIONS

- M. Site Condition: Leave all areas around job site free of debris, roofing materials, equipment and related items after completion of job.
- N. Notification Of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.
- O. Final Inspection
 - 1. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.
- P. Issuance Of The Guarantee: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

END OF SECTION 075419

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**SECTION 077100
ROOF SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manufactured roof specialties, including copings and pipe penetrations.

1.02 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels 2013.
- B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems 2017.
- C. NRCA (RM) - The NRCA Roofing Manual 2019.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Roof Edge Flashings and Copings:
 - 1. ATAS International, Inc; Continuous Cleat Coping: www.atas.com/#sle.
 - 2. W.P. Hickman Company; PermaSnap 2 Coping: www.wph.com.
- B. Counterflashings:

2.02 COMPONENTS

- A. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
 - 1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
 - 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
 - 3. Material: Formed aluminum sheet, 0.040 inch thick, minimum.
 - 4. Finish: 70 percent polyvinylidene fluoride.
 - 5. Color: match metal siding color (as determined by Architect).
- B. Pipe and Penetration Flashing: Base of rounded aluminum, compatible with PVC sheet membrane roof systems, and capable of accomodating pipes sized between 3/8 inch and 12 inch.
 - 1. Color: As indicated on drawings.
- C. Roof Penetration Sealing Systems: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- D. Pipe Penetration Wall Seal: Seal for HVAC piping wall penetrations with wall mounted rigid plastic outlet cover and elastomeric wall seal gasket.
 - 1. Outlet Cover Color: Gray.
- E. Pipe Penetration Wall Seal and Insulated Piping Protection System: Seal for HVAC piping wall penetrations with wall mounted rigid plastic outlet cover and elastomeric wall seal gasket and having mechanical line insulation with PVC protective cover.
 - 1. Outlet Cover Color: Gray.
 - 2. PVC Insulation Cover Color: Black with full-length velcro fastener.

2.03 ACCESSORIES

- A. Sealant for Joints in Linear Components: As recommended by component manufacturer.
- B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

2.04 FINISHES

- A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.05 ACCESSORIES

- A. Sealant for Joints in Linear Components: As recommended by component manufacturer.
- B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Seal joints within components when required by component manufacturer.
- C. Anchor components securely.
- D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
- E. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.
- F. Coordinate installation of flashing flanges into reglets.

END OF SECTION 077100

**SECTION 077200
ROOF ACCESSORIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Curbs.
- B. Equipment rails.
- C. Roof penetrations mounting curbs.
- D. Non-penetrating pedestals.

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2015.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2009.
- C. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process 2010 (Reapproved 2015).
- D. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2009.
- E. UL (DIR) - Online Certifications Directory current listings at database.ul.com.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.
- C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
 - 1. Submit shop drawings sealed and signed by a Professional Engineer experienced in design of this type of work and licensed in Florida.
- D. Warranty Documentation:
 - 1. Submit manufacturer warranty.
 - 2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 ROOF CURBS

- A. Manufactured Curbs:
 - 1. AES Industries Inc; []: www.aescurb.com/#sle.
 - 2. The Pate Company; []: www.patecurbs.com/#sle.
 - 3. Roof Products & Systems (RPS); []: www.rpscurbs.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.

- B. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
 - 1. Roof Curb Mounting Substrate: Curb substrate consists of flat roof deck sheathing with insulation.
 - 2. Sheet Metal Material:
 - a. Aluminum: 0.080 inch minimum thickness, with 3003 alloy, and H14 temper.
 - 1) Finish: Clear anodized.
 - 3. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing system at 1:1 slope; minimum cant height 4 inches.
 - 4. Provide layouts and configurations indicated on drawings.
- C. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
 - 1. Provide preservative treated wood nailers along top of curb.
 - 2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
 - 3. Height Above Finished Roof Surface: 8 inches, minimum.
- D. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
 - 1. Height Above Finished Roof Surface: 8 inches, minimum.
 - 2. Manufacturers:
- E. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches square unless otherwise indicated.
 - 1. Provide sliding channel welded along top edge with adjustable height steel bracket, fabricated to fit item supported.
 - 2. Height Above Finished Roof Surface: 8 inches, minimum.

2.02 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES

- A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly.
 - 1. Design Loadings and Configurations: As required by applicable codes.
 - 2. Height: Provide minimum clearance of 6 inches under supported items to top of roofing.
 - 3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - 4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - 5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.
- B. Pipe Supports: Provide attachment fixtures complying with MSS SP-58 and as indicated.
 - 1. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
- C. Duct Supports: Provide extruded aluminum supports and sized in accordance with diameter of supported ducts, and with base that is non-penetrating of roofing membrane.
- D. Conduit and Cable Tray Supports:
- E. Non-Penetrating Pedestals: Steel pedestals with square, round, or rectangular bases.
 - 1. Bases: High density polypropylene.
 - 2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - 3. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

PART 3 EXECUTION

3.01 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.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

- A. Clean installed work to like-new condition.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 077200

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**SECTION 078100
APPLIED FIRE PROTECTION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Applied fire protection of interior structural steel not exposed to damage or moisture.
- B. Applied fire protection of structural steel exposed to damage or moisture.
- C. Preparation of applied fire protection for application of exposed overcoat finish specified elsewhere.

1.02 RELATED REQUIREMENTS

- A. Section 051200 - Structural Steel Framing.
- B. Section 078123 - Intumescent Fire Protection.
- C. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- B. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members 1993, with Editorial Revision (2015).
- C. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members 2019.
- D. ASTM E759/E759M - Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members 1992 (Reapproved 2020).
- E. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members 1992 (Reapproved 2020).
- F. ASTM E859/E859M - Standard Test Method for Air Erosion of Sprayed Fire-Resistive Material (SFRMs) Applied to Structural Members 1993 (Reapproved 2020).
- G. ASTM E937/E937M - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members 1993 (Reapproved 2020).
- H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015 (Reapproved 2021)e1.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittals procedures.
- B. Product Data: Provide data indicating product characteristics.
- C. Test Reports: Reports from reputable independent testing agencies for proposed products, indicating compliance with specified criteria, conducted under conditions similar to those on project, as follows:
 - 1. Bond strength.
 - 2. Bond impact.
 - 3. Compressive strength.
 - 4. Fire tests using substrate materials similar those on project.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Manufacturer's Certificate: Certify that sprayed-on fireproofing products meet or exceed requirements of contract documents.
- F. Manufacturer Reports: Indicate environmental conditions that applied fireproofing materials were installed.
- G. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 5 years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience
 - 1. Having minimum 3 years of documented experience.

1.06 MOCK-UP

- A. Construct mock-up, 100 square feet in size.
- B. Comply with project requirements for fire ratings.
- C. Locate where directed.
- D. Examine installation within one hour of application to determine variances from specified requirements due to shrinkage, temperature, and humidity.
- E. Where shrinkage and cracking are evident, adjust mixture and method of application as necessary; remove materials and re-construct mock-up.
- F. Mock-up may remain as part of the Work.

1.07 FIELD CONDITIONS

- A. Do not apply fireproofing when temperature of substrate material and surrounding air is below 40 degrees F or when temperature is predicted to be below said temperature for 24 hours after application.
- B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.
- C. Provide temporary enclosure to prevent spray from contaminating air.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a two year period after Date of Substantial Completion.
 - 1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
 - 2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Applied Fire Protection:
 - 1. Carboline Company; [____]: www.carboline.com.
 - 2. GCP Applied Technologies; [____]: www.gcpat.com/#sle.
 - 3. Isolatek International Corp; [____]: www.isolatek.com/#sle.
 - 4. Southwest Fireproofing Products Company; [____]: www.sfrm.com/#sle.

2.02 APPLIED FIRE PROTECTION ASSEMBLIES

- A. Provide assemblies as indicated on drawings.

2.03 MATERIALS

- A. Applied Fireproofing Material , interior exposed and concealed applications: Manufacturer's standard factory mixed material, which when combined with water is capable of providing indicated fire resistance, and complying with following requirements:
 - 1. Composition: Gypsum-based; not mineral-fiber-based.
 - 2. Bond Strength: 339 psf, minimum, when tested in accordance with ASTM E736 when set and dry.
 - 3. Dry Density: Minimum average density of 15 lb/cu ft, with minimum individual density of any test sample of 14 lb/cu ft, when tested in accordance with ASTM E605/E605M.
 - 4. Compressive Strength: 1,440 pounds per square inch, minimum.
 - 5. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760/E760M.

6. Corrosivity: No evidence of corrosion, when tested in accordance with ASTM E937/E937M.
 7. Air Erosion Resistance: Weight loss of 0, maximum, when tested in accordance with ASTM E859 after 24 hours.
 8. Surface Burning Characteristics: Maximum flame spread index of 0 (zero) and maximum smoke developed index of 0 (zero), when tested in accordance with ASTM E84.
 9. Effect of Deflection: No cracking, spalling, or delamination, when tested in accordance with ASTM E759/E759M.
 10. Fungal Resistance: No growth after 28 days when tested according to ASTM G21.
 11. Manufacturers:
 - a. GCP Applied Technologies; Monokote MK-6: www.gcpat.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- B. Applied Fire Protection Material Exposed to Damage or Moisture: Manufacturer's standard factory mixed material, which when combined with water is capable of providing indicated fire resistance, and complying with following requirements:
1. Basis of Design: Cafco Blaze-Shield II by Isolatek International.
 2. Composition: Portland cement-based; not mineral fiber-based.
 3. Bond Strength: 1,000 psf, minimum, when tested in accordance with ASTM E736/E736M when set and dry.
 4. Dry Density: 16 lb/cu ft, minimum, when tested in accordance with ASTM E605/E605M.
 5. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760/E760M.
 6. Corrosivity: No evidence of corrosion, when tested in accordance with ASTM E937/E937M.
 7. Air Erosion Resistance: Weight loss of 0.000g/sf, maximum, when tested in accordance with ASTM E859/E859M after 24 hours.
 8. Surface Burning Characteristics: Maximum flame spread index of 0 (zero) and maximum smoke developed index of 0 (zero), when tested in accordance with ASTM E84.

2.04 ACCESSORIES

- A. Primer Adhesive: Of type recommended by applied fire protection manufacturer.
- B. Water: Clean, potable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive fireproofing.
- B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.
- C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.
- D. Verify that voids and cracks in substrate have been filled.
- E. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.02 PREPARATION

- A. Perform tests as recommended by fireproofing manufacturer in applications where adhesion of fireproofing to substrate is in question.
- B. Remove incompatible materials that could effect bond by scraping, brushing, scrubbing, or sandblasting.
- C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.
- D. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

- E. Close off and seal duct work in areas where fireproofing is being applied.

3.03 APPLICATION

- A. Apply primer adhesive in accordance with manufacturer's instructions.
- B. Apply fireproofing in uniform thickness and density as necessary to achieve required ratings.

3.04 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 014000 - Quality Requirements.
- B. Inspect installed fireproofing after application and curing for integrity, prior to its concealment.
- C. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of authorities having jurisdiction (AHJ).
- D. Repair or replace applied fireproofing at locations where test results indicate fireproofing does not meet specified requirements.
- E. Re-inspect installed fireproofing for integrity of fire protection, after installation of subsequent Work.

3.05 CLEANING

- A. Remove excess material, overspray, droppings, and debris.
- B. Remove fireproofing from materials and surfaces not required to be fireproofed.
- C. At exposed fireproofing, clean surfaces that have become soiled or stained, using manufacturer's recommended procedures.

END OF SECTION 078100

**SECTION 078123
INTUMESCENT FIRE PROTECTION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Thin-film intumescent mastic fireproofing for exposed structural steel.

1.02 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- C. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2020.
- D. SSPC-PA 2 - Procedure For Determining Conformance To Dry Coating Thickness Requirements 2015, with Editorial Revision (2018).

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittals procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Performance characteristics and test results.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
- C. Selection Samples: For decorative top coat, color chips representing manufacturer's full range of available colors and sheens.
- D. Verification Samples: For each thickness, color, sheen, and finish required, samples not less than 4 inches square on steel substrate, illustrating finished appearance.
- E. Certificates: Certify that intumescent fireproofing provided for this project meets or exceeds specified requirements in all respects.
- F. Field Quality Control Submittals: Submit field test report.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company that specializes in manufacturing the type of products specified, with minimum of ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.
- C. MOCK-UP
 - 1. Provide a mock-up for evaluation of surface preparation techniques and application workmanship; approved mock-up will serve as a standard of comparison for subsequent work of this section.
 - 2. Evaluate mock-up for compliance with specified requirements, including thickness and finish texture.
 - 3. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 4. Refinish mock-up area as required to produce acceptable work.
 - 5. Approved mock-up may remain as part of the project.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened containers with identification labels and testing agency markings intact and legible.
- B. Store products in manufacturer's unopened packaging until ready for installation.
 - 1. Store at temperatures not less than 50 degrees F in dry, protected area.

2. Protect from freezing, and do not store in direct sunlight.
 3. Dispose of any materials that have come into contact with contaminants of any kind prior to application.
- C. Dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

- A. Protect areas of application from windblown dust and rain.
- B. Maintain ambient field conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under ambient conditions outside manufacturer's absolute limits.
1. Provide temporary enclosures as required to control ambient conditions.
 2. Do not apply intumescent fireproofing when ambient temperatures are below 50 degrees F without specific approval from manufacturer.
 3. Maintain relative humidity between 40 and 60 percent in areas of application.
 4. Maintain ventilation in enclosed spaces during application and for not less than 72 hours afterward.

PART 2 PRODUCTS

2.01 SYSTEM REQUIREMENTS

- A. Fireproofing: Provide intumescent thin-film fire resistive coating systems tested by an independent testing agency in accordance with ASTM E119 and acceptable to authorities having jurisdiction (AHJ).
1. Provide assemblies listed by UL or FM and bearing listing agency label or mark.
- B. Structural Steel Columns: Fire resistance rating of 2 hours.
- C. Structural Steel Beams: Fire resistance rating of 2 hours.

2.02 MATERIALS

- A. Fire Resistive Coating System: Thin film intumescent mastic fireproofing system for fire protection of structural steel.
1. Surface Burning Characteristics: Tested in accordance with ASTM E84.
 - a. Flame Spread Index (FSI): 25, maximum.
 - b. Smoke Developed Index (SDI): 65, maximum.
 2. For Interior Use:
 - a. Use only products without fiber content.
 - b. VOC Content: Less than 500 g per L when tested in accordance with 40 CFR 59, Subpart D (EPA Method 24).
 - c. Basis of Design: Carboline Company; FIREFILM III C.
 - d. Basis of Design: Carboline Company; Thermo-Lag E100 S.
- B. Coatings as recommended by the fire proofing manufacturer are as follows:
1. Prime Coat: Carbomastic 615 Grey at 4.0 to 8.0 mils dft.
 2. Intumescent: Thermo-Lag E100S at 380 mils dft.
 3. Seal Coat: Carboguard 1340 at 1.0 to 2.0 mils dft.
 4. Finish Coat: Carbothane 133 HB at 3.0 to 5.0 dft. Color to be selected from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates to determine if they are in satisfactory condition to receive intumescent fireproofing; verify that substrates are clean and free of oil, grease, incompatible primers, or other foreign substances capable of impairing bond to fireproofing system.
- B. Do not begin installation until substrates have been properly prepared.

- C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Thoroughly clean surfaces to receive fireproofing.
- B. Repair substrates to remove surface imperfections that could effect uniformity of texture and thickness of fireproofing system, and remove minor projections and fill voids that could telegraph through finished work.
- C. Cover or otherwise protect other work that might be damaged by fallout or overspray of fireproofing system, and provide temporary enclosures as necessary to confine operations and maintain required ambient field conditions.

3.03 INSTALLATION

- A. Comply with manufacturer's instructions for particular conditions of installation in each case.
- B. Apply manufacturer's recommended primer to required coating thickness.
- C. Apply fireproofing to full thickness over entire area of each substrate to be protected.
- D. Apply coats at manufacturer's recommended rate to achieve dry film thickness (DFT) as required for fire resistance ratings designated for each condition.
- E. Achieve uniform finished appearance complying with approved mock-up.

3.04 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 014000 - Quality Requirements.
 - 1. Arrange for testing of installed intumescent mastic fireproofing by an independent testing laboratory using magnetic pull-off dry film thickness gage in accordance with SSPC-PA 2, and ensure it meets requirements of authorities having jurisdiction (AHJ).
 - 2. Submit field test reports promptly to Contractor and Architect.

3.05 CLEANING

- A. Immediately after installation of fireproofing in each area, remove overspray and fallout from other surfaces and clean soiled areas.

3.06 PROTECTION

- A. Protect installed intumescent mastic fireproofing from damage due to subsequent construction activities, so fireproofing is without damage or deterioration before Date of Substantial Completion.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 078123

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**SECTION 078400
FIRESTOPPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping of joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

- A. Section 070553 - Fire and Smoke Assembly Identification.
- B. Section 078100 - Applied Fire Protection.

1.03 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2020.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).
- C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems 2015 (Reapproved 2019).
- D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems 2020a.
- E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers 2020a.
- F. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus 2020.
- G. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies 2013 (Reapproved 2017).
- H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015 (Reapproved 2021)e1.
- I. ITS (DIR) - Directory of Listed Products current edition.
- J. FM 4991 - Approval Standard for Firestop Contractors 2013.
- K. FM (AG) - FM Approval Guide current edition.
- L. SCAQMD 1168 - Adhesive and Sealant Applications 1989 (Amended 2017).
- M. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems Current Edition, Including All Revisions.
- N. UL (DIR) - Online Certifications Directory Current Edition.
- O. UL (FRD) - Fire Resistance Directory Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- C. Sustainable Design Submittal: Submit VOC content documentation for nonpreformed materials.
- D. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system or fire-resistive joint system, submit illustration, with modifications marked, approved by system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal
- E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

- G. Installer's qualification statement.

1.05 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. All through-penetration firestops shall be provided by one manufacturer.
- D. Installer Qualifications: Company specializing in performing the work of this section and:
1. Trained by manufacturer.
 2. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
 3. Verification of minimum three years documented experience installing work of this type.
 4. Verification of at least five satisfactorily completed projects of comparable size and type.
 5. Licensed by local authorities having jurisdiction (AHJ).
- E. All fire-resistive joints and perimeter fire barriers shall be provided by one manufacturer.

1.06 MOCK-UP

- A. Install one firestopping assembly representative of each fire rating design required on project.
1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
- B. If accepted, mock-up will represent minimum standard for this work.

1.07 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Firestopping Manufacturers:
1. 3M Fire Protection Products; [____]: www.3m.com/firestop/#sle.
 2. Hilti, Inc; [____]: www.us.hilti.com/#sle.
 3. Specified Technologies Inc; [____]: www.stifirestop.com/#sle.
 4. RectorSeal.
 5. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

- A. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
- B. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
- C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- D. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.

- B. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
- C. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
- D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
 - 1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 - 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 - 3. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.04 FIRESTOPPING FOR FLOOR-TO-FLOOR, FLOOR-TO-WALL, HEAD-OF-WALL, AND WALL-TO-WALL JOINTS

2.05 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

- A. Blank Openings:
 - 1. In Floors or Walls:
 - a. 2 Hour Construction: UL System C-AJ-0090; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 2 Hour Construction: UL System C-AJ-0015; Specified Technologies Inc. SSM mortar.
- B. Penetrations Through Floors or Walls By:
 - 1. Multiple Penetrations in Large Openings:
 - a. 2 Hour Construction: UL System C-AJ-8055; Specified Technologies Inc. SSP Firestop Putty.
 - b. 2 Hour Construction: UL System C-AJ-8114; Specified Technologies Inc. SSM mortar.
 - 2. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System C-AJ-1226; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - 3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System C-AJ-2167; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 2 Hour Construction: UL System C-AJ-2109; Hilti CP 643N/644 Firestop Collar.
 - 4. Electrical Cables Not In Conduit:
 - a. 2 Hour Construction: UL System W-J-3046; Specified Technologies Inc. SSP Firestop Putty.
 - 5. Cable Trays with Electrical Cables:
 - a. 2 Hour Construction: UL System C-AJ-4094; Hilti CFS-BL Firestop Block.
 - 6. Insulated Pipes:
 - a. 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE IMAX intumescent Firestop Sealant.
 - 7. HVAC Ducts, Uninsulated:
 - a. 2 Hour Construction: UL System C-AJ-7111; Hilti FS-ONE MAX Intumescent Firestop Sealant.
- C. Penetrations Through Floors By:
 - 1. Multiple Penetrations in Large Openings:
 - a. 2 Hour Construction: UL System F-A-8012; Hilti CFS-S SIL GG Firestop Silicone Sealant Gun-Grade or CFS-S SIL SL Firestop Silicone Sealant Self-Leveling.
 - 2. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System F-A-1016; Hilti CP 680-P/M Cast-In Device.

- b. 2 Hour Construction: UL System F-A-1110; Specified Technologies Inc. CID cast-in devices.
 - 3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System F-A-2065; Hilti CP 680-P Cast-In Device.
 - b. 2 Hour Construction: UL System F-A-2246; Specified Technologies Inc. CID cast-in devices.
 - 4. Insulated Pipes:
 - a. 2 Hour Construction: UL System F-A-5015; Hilti CP 680-P/M Cast-In Device.
 - b. 2 Hour Construction: UL System F-A-5041; Specified Technologies Inc. CID cast-in devices.
- D. Penetrations Through Walls By:
 - 1. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 1 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - 2. Insulated Pipes:
 - a. 2 Hour Construction: UL System C-AJ-5090; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 1 Hour Construction: UL System C-AJ-5090; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - 3. HVAC Ducts, Uninsulated:
 - a. 2 Hour Construction: UL System W-J-7092; Specified Technologies Inc. FyreFlange HVAC Firestop Angle.
 - b. 2 Hour Construction: UL System W-J-7109; Hilti FS-ONE MAX Intumescent Firestop Sealant or CP 606 Flexible Firestop Sealant.
 - 4. HVAC Ducts, Insulated:
 - a. 2 Hour Construction: UL System W-J-7112; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.06 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

- A. Blank Openings:
 - 1. 2 Hour Construction: UL System W-L-0038; Specified Technologies Inc. FP Intumescent Firestop Plug.
 - 2. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
 - 3. 1 Hour Construction: UL System W-L-0038; Specified Technologies Inc. FP Intumescent Firestop Plug.
 - 4. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
- B. Penetrations By:
 - 1. Multiple Penetrations in Large Openings:
 - a. 2 Hour Construction: UL System W-L-1408; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 2 Hour Construction: UL System W-L-8013; Hilti CFS-BL Firestop Block.
 - c. 2 Hour Construction: UL System W-L-8025; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
 - 2. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 1 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - 3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.
 - b. 2 Hour Construction: UL System W-L-2128; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - c. 1 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.

- d. 1 Hour Construction: UL System W-L-2128; Hilti FS-ONE MAX Intumescent Firestop Sealant.
4. Cable Trays with Electrical Cables:
 - a. 2 Hour Construction: UL System W-L-4011; Hilti CFS-BL Firestop Block.
 - b. 2 Hour Construction: UL System W-L-4060; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - c. 1 Hour Construction: UL System W-L-4011; Hilti CFS-BL Firestop Block.
 - d. 1 Hour Construction: UL System W-L-4060; Hilti FS-ONE MAX Intumescent Firestop Sealant.
5. Insulated Pipes:
 - a. 2 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 2 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.
 - c. 1 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - d. 1 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.
6. HVAC Ducts, Insulated:
 - a. 2 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 2 Hour Construction: UL System W-L-7164; Specified Technologies Inc. FyreFlange HVAC Firestop Angle.
 - c. 1 Hour Construction: UL System W-L-7164; Specified Technologies Inc. FyreFlange HVAC Firestop Angle.
 - d. 1 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.
- B. Inspections of through-penetration firestop systems shall be conducted in accordance with the Post-Installation Method outlined in ASTM E 2174. A minimum of 2%, but not less than one, of each type of firestop system shall be inspected per floor or for each area of a floor when a floor is larger than 10,000 square feet.
- C. Inspections of fire-resistive joints and perimeter fire barrier systems shall be conducted in accordance with the Post-Installation Method outlined in ASTM E 2393. A minimum of one sample per 500 lineal feet, but not less than one, of each type of fire-resistive joint shall be inspected.
- D. Destructive testing shall be done in accordance with the International Firestop Counsel's (IFC) IFC Recommended Guidelines for Performing Destructive testing for Installed Penetration Firestop Systems, Fire-Resistive Joint Systems, or Perimeter Fire Barrier Systems dated April 10, 2012.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by Owner's Independent Testing Agency.

- C. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.
- B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.
- C. Where deficiencies are found or firestops are damaged or removed because of testing, repair, or replacing firestopping to comply with requirements:
 - 1. Any type of firestop or fire-resistive joint system does not comply with the inspection documents will require repair or replacement and re-inspection of that firestop/joint system plus one full additional inspection of the percentage specified for that system type. If non-compliance occurs on 10% or more of the quantities of firestop products, systems, or joints, then inspection of those particular types will cease. The installer shall inspect their own work and shall repair or replace those system types with the area prior to recommencement of inspections by the inspector.
 - 2. The cost for repair, replacement of tested locations, re-inspection (if required), and retesting (if required), shall be paid for by the contractor and/or sub-contractor. The Owner shall not be responsible for additional costs.
 - 3. The time and expenses for the Special Inspector for Firestop Systems to re-inspect or direct any retests shall be a charge to the Construction Manager based on actual time and expenses, with a minimum charge of \$1,000 per day. The costs associated with re-inspection and/or re-testing shall be paid by the Construction Manager to the Special Inspector. The Construction Manager shall be responsible for any cost recovery for re-inspection and retesting costs from the associated sub-contractor.

3.05 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 078400

**SECTION 079200
JOINT SEALANTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Joint backings and accessories.

1.02 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer 2015.
- B. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants 2018.
- C. ASTM C834 - Standard Specification for Latex Sealants 2017.
- D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications 2019.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- F. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems 2016.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- H. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants 2018.
- I. ASTM C1311 - Standard Specification for Solvent Release Sealants 2014.
- J. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints 2019 (Reapproved 2020).
- K. SCAQMD 1168 - Adhesive and Sealant Applications 1989 (Amended 2017).

1.03 SUBMITTALS

- A. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 4. Substrates the product should not be used on.
- B. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- D. Sustainable Design Documentation: For sealants and primers, submit VOC content and emissions documentation; see Section 016116.
- E. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- F. Field Quality Control Plan: Submit at least two weeks prior to start of installation.
- G. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

1.04 QUALITY ASSURANCE

- A. Maintain one copy of each referenced document covering installation requirements on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

- C. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- E. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - 1. Adhesion Testing: In accordance with ASTM C794.
 - 2. Compatibility Testing: In accordance with ASTM C1087.
 - 3. Allow sufficient time for testing to avoid delaying the work.
 - 4. Deliver to manufacturer sufficient samples for testing.
 - 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
 - 6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
- F. Field Quality Control Plan:
 - 1. Inspection and testing to be performed by the manufacturer's representative.
 - 2. Visual inspection of entire length of sealant joints.
 - 3. Non-destructive field adhesion testing of sealant joints.
 - a. For each different sealant and substrate combination, allow for one test every 12 inches in the first 10 linear feet of joint and one test every 24 inches thereafter.
 - b. If any failures occur in the first 10 linear feet, continue testing at 12 inches intervals at no extra cost to Owner.
 - 4. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.
- G. Field Adhesion Test Procedures:
 - 1. Allow sealants to fully cure as recommended by manufacturer before testing.
 - 2. Have a copy of the test method document available during tests.
 - 3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
 - 4. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.
- H. Non-Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Spot Method.
 - 1. Record results on Field Quality Control Log.
 - 2. Repair failed portions of joints.
- I. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or other applicable method as recommended by manufacturer.

1.05 WARRANTY

- A. Correct defective work within a five year period after Date of Substantial Completion.
- B. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
 - a. Wall expansion and control joints.
 - b. Joints between door, window, and other frames and adjacent construction.

- c. Joints between different exposed materials.
- d. Openings below ledge angles in masonry.
- e. Other joints indicated below.
- 2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between door, window, and other frames and adjacent construction.
 - b. Between plumbing fixtures and wall.
 - c. Between casework and wall.
 - d. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
 - 1) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
 - e. Other joints indicated below.
- 3. Do not seal the following types of joints.
 - a. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
 - b. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - c. Joints where installation of sealant is specified in another section.
 - d. Joints between suspended panel ceilings/grid and walls.
- B. Exterior Joints: Use nonsag non-staining silicone sealant, unless otherwise indicated.
- C. Interior Joints: Use nonsag acrylic latex sealant, unless otherwise indicated.
 - 1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
 - 2. Type [] - In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
- D. Interior Wet Areas: Bathrooms, restrooms, kitchens, and food service areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.
- E. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.02 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.
- B. Colors: As indicated on drawings.

2.03 NONSAG JOINT SEALANTS

- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: +100/-50%, minimum.
 - 2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
 - 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 - 4. Color: To be selected by Architect from manufacturer's standard range.
 - 5. Cure Type: [].
 - 6. Service Temperature Range: Minus 20 to 180 degrees F.
 - 7. Manufacturers:
 - a. Dow Chemical Company; 790 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- B. ---- Hybrid Silane Polyether for Interior and Exterior Horizontal, Vertical and Overhead Use ----
- C. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.

1. Color: To be selected by Architect from manufacturer's standard range.
2. Grade: ASTM C834; Grade Minus 18 Degrees C (0 Degrees F).
3. Manufacturers:
 - a. Hilti, Inc; CP 506 Smoke and Acoustical Sealant: www.us.hilti.com/#sle.
 - b. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
 - c. Tremco Commercial Sealants & Waterproofing; Tremflex 834: www.tremcosealants.com/#sle.
 - d. Tremco Commercial Sealants & Waterproofing; Tremstop Smoke & Sound: www.tremcosealants.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
- D. ---- Unique Water-Based Elastomeric Acrylic Latex, Interior and Exterior Use ----
- E. ---- Unique Acrylic Latex, UL Classified for Use in Fire Rated Systems ----
- F. Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag; not expected to withstand continuous water immersion or traffic.
 1. Hardness Range: 10 to 30, Shore A, when tested in accordance with ASTM C661.
 2. Color: To be selected by Architect from manufacturer's standard range.
 3. Service Temperature Range: Minus 13 to 180 degrees F.
 4. Manufacturers:
 - a. Sherwin-Williams Company; Storm Blaster All Season Sealant: www.sherwin-williams.com/#sle.

2.04 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
 1. Open Cell: 40 to 50 percent larger in diameter than joint width.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.

- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

- A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet, notify Architect immediately.
- C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.05 POST-OCCUPANCY

- A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width; i.e. at low temperature in thermal cycle. Report failures immediately and repair.

END OF SECTION 079200

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**SECTION 081113
HOLLOW METAL DOORS AND FRAMES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Fire-rated hollow metal doors and frames.
- D. Thermally insulated hollow metal doors with frames.
- E. Hollow metal borrowed lites glazing frames.

1.02 RELATED REQUIREMENTS

- A. Section 087101 - HARDWARE.
- B. Section 088000 - Glazing: Glass for doors and borrowed lites.
- C. Section 099113 - Exterior Painting: Field painting.
- D. Section 099123 - Interior Painting: Field painting.

1.03 ABBREVIATIONS AND ACRONYMS

- A. ANSI: American National Standards Institute.
- B. HMMA: Hollow Metal Manufacturers Association.
- C. NAAMM: National Association of Architectural Metal Manufacturers.
- D. NFPA: National Fire Protection Association.
- E. SDI: Steel Door Institute.
- F. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2018.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2020.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
- H. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames 2016.
- I. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- J. ITS (DIR) - Directory of Listed Products current edition.
- K. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames 2002.
- L. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames 2011.
- M. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2007.

- N. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2014.
- O. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.
- P. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2019.
- Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2017.
- R. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames 2013.
- S. UL (DIR) - Online Certifications Directory Current Edition.
- T. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.
- U. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Samples: Submit two samples of metal, 2 inch by 2 inch in size showing factory finishes, colors, and surface texture.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
 - 1. Provide hollow metal frames from SDI Certified manufacturer.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- C. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
 - 2. Republic Doors: www.republicdoor.com.
 - 3. Steelcraft, an Allegion brand: www.allegion.com/us.

2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM

- A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
 4. Door Edge Profile: Manufacturers standard for application indicated.
 5. Typical Door Face Sheets: Flush.
 6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Flush.
 7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
 - a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.
- B. Hollow Metal Panels: Same construction, performance, and finish as doors.
- C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished.
- B. Exterior Doors: Thermally insulated.
1. Grade: ANSI/SDI A250.8 (SDI-100); Level 3 - Extra Heavy-Duty, Physical Performance Level A, Model 2 - Seamless.
 - a. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - b. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 3. Door Thickness: 1-3/4 inch, nominal.
 4. Door Face Sheets: Flush.
 5. Weatherstripping: Refer to Section 087101.
 6. Door Finish: Factory primed and field finished.
 7. Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch- thick, metallic-coated steel channels with channel webs placed even with top and bottom edges. Door top shall be seamless.
- C. Interior Doors, Non-Fire Rated:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy Duty Commercial.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 3. Door Thickness: 1-3/4 inch, nominal.
 4. Door Face Sheets: Flush.
 5. Door Finish: Factory primed and field finished.

- D. Fire-Rated Doors:
1. Grade: ANSI/SDI A250.8 (SDI-100); Level 3 - Extra Heavy-Duty, Physical Performance Level A, Model 2 - Seamless.
 - a. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - b. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - c. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 - a. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.
 - b. Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - c. Attach fire rating label to each fire rated unit.
 - d. Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
 - 1) Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
 - 2) Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
 - 3) Label: Include the "S" label on fire-rating label of door.
 3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
 4. Door Thickness: 1-3/4 inch, nominal.
 5. Door Face Sheets: Flush.
 6. Door Finish: Factory primed and field finished.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Factory primed and field finished.
- C. Exterior Door Frames: Full profile/continuously welded type with sealed top edge.
 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvanized) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 2. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
 3. Frame Finish: Factory primed and field finished.
 4. Weatherstripping: Separate, see Section 087101.
 5. Head: Fully closed top channel at door head.
- D. Interior Door Frames, Non-Fire Rated: Knock-down type.
 1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 2. Frame Finish: Factory primed and field finished.
- E. Door Frames, Fire-Rated: Full profile/continuously welded type.
 1. Fire Rating: Same as door, labeled.
 2. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
 3. Frame Finish: Factory primed and field finished.
- F. Mullions for Pairs of Doors: Removable type, with profile similar to jambs.
- G. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
- H. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

- I. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inch high to fill opening without cutting masonry units.
- J. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

- A. Glazing: as indicated on drawings, factory installed.
- B. Removable Stops: Rolled steel bar, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- C. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.
- D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- E. Install door hardware as specified in Section 087100.
- F. Coordinate installation of electrical connections to electrical hardware items.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION 081113

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**SECTION 081416
FLUSH WOOD DOORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush wood doors; flush configuration; fire rated and non-rated.

1.02 RELATED REQUIREMENTS

- A. Section 081113 - Hollow Metal Doors and Frames.
- B. Section 087101 - HARDWARE.
- C. Section 088000 - Glazing.

1.03 REFERENCE STANDARDS

- A. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.
- B. AWI (QCP) - Quality Certification Program Current Edition.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 4.0 2021.
- E. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.
- F. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2017.
- G. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.
- H. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
 - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- D. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
 - 1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Quality Certification:
 - 1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 2. Provide designated labels on installed products as required by certification program.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with

tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Eggers Industries; [____]: www.eggersindustries.com/#sle.
 - 2. Graham Wood Doors; [____]: www.grahamdoors.com/#sle.
 - 3. Marshfield DoorSystems, Inc; [____]: www.marshfielddoors.com/#sle.

2.02 DOORS

- A. Doors: Refer to drawings for locations and additional requirements.
 - 1. Quality Level: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS).
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at all locations.
 - 2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) labeled without any visible seals when door is open.
 - 3. Smoke and Draft Control Doors (Indicated as "S" on Drawings): In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm per sq ft of door opening at 0.10 inch wg pressure at both ambient and elevated temperatures for "S" label; if necessary, provide additional gasketing or edge sealing.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 60 Minute Rated Doors: Type structural composite lumber core (SCLC), plies and faces as indicated.
- B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: White oak, veneer grade in accordance with quality standard indicated, rift cut (only red and white oak), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
 - 1. Finish: Architect to select from manufacturers full range of color options.

2.05 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
 - 1. Provide solid blocks at lock edge for hardware reinforcement.
 - 2. Provide solid blocking for other throughbolted hardware.
- C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

- E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- F. Provide edge clearances in accordance with the quality standard specified.

2.06 FACTORY FINISHING - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:
 - a. System - 9, UV Curable, Acrylated Epoxy, Polyester or Urethane.
 - b. Stain: As selected by Architect.
 - c. Sheen: Satin.
- B. Factory finish doors in accordance with approved sample.
- C. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

- A. Hollow Metal Door Frames: As specified in Section 081113.
- B. Glazed Openings:
 - 1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
- C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
 - 1. Install fire-rated doors in accordance with NFPA 80 requirements.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.
- F. Install door louvers plumb and level.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION 081416

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**SECTION 083100
ACCESS DOORS AND PANELS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall access door and frame units.
- B. Ceiling access door and frame units.

1.02 REFERENCE STANDARDS

- A. UL (FRD) - Fire Resistance Directory Current Edition.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Wall-Mounted Units:
 - 1. Location: As indicated on drawings.
 - 2. Material: Steel.
 - 3. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
- B. Wall-Mounted Units in Wet Areas:
 - 1. Location: As indicated on drawings.
 - 2. Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
 - 3. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
- C. Fire-Rated Wall-Mounted Units:
 - 1. Location: As indicated on drawings.
 - 2. Wall Fire-Rating: As indicated on drawings.
 - 3. Material: Steel.
 - 4. Size: As indicated on drawings.
- D. Ceiling-Mounted Units:
 - 1. Location: As indicated on drawings.
 - 2. Material: Steel.
 - 3. Size: As indicated on drawings.
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL AND CEILING MOUNTED UNITS

- A. Manufacturers:
 - 1. ACUDOR Products Inc: www.acudor.com/#sle.
 - 2. Babcock-Davis; []: www.babcockdavis.com/#sle.
 - 3. Nystrom, Inc; []: www.nystrom.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 - 1. Door Style: Single thickness with rolled or turned in edges.
 - 2. Frames: 16 gage, 0.0598 inch, minimum thickness.

3. Heavy Duty Single Steel Sheet Door Panels: 14 gage, 0.0747 inch, minimum thickness.
4. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
 - a. Provide products listed by UL (FRD) as suitable for purpose indicated.
5. Steel Finish: Primed.
6. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.
7. Size: Selected from manufacturer's full range.
8. Hardware:
 - a. Hardware for Fire-Rated Units: As required for listing.
 - b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
 - c. Latch/Lock: Tamperproof tool-operated cam latch.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION 083100

**SECTION 083323
OVERHEAD COILING DOORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Overhead coiling doors and shutters, operating hardware, fire-rated, non-fire-rated, and exterior; manually or electrically operated.
- B. Wiring from electric circuit disconnect to operator to control station.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- D. ITS (DIR) - Directory of Listed Products current edition.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts 2000, with Errata (2008).
- G. NEMA MG 1 - Motors and Generators 2018.
- H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL (DIR) - Online Certifications Directory Current Edition.
- J. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general construction, electrical equipment, and component connections and details.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

PART 2 PRODUCTS

2.01 COILING DOORS

- A. Exterior Coiling Doors: Steel slat curtain.
 - 1. Refer to structural drawings for required wind load criteria.
 - 2. Sandwich slat construction with insulated core of foamed-in-place polyurethane insulation; minimum R-value of 8.1.
 - 3. Nominal Slat Size: 2 inches wide x required length.
 - 4. Finish: Factory painted, color as selected.
 - 5. Guide, Angles: Galvanized steel.
 - 6. Hood Enclosure: Manufacturer's standard; primed steel.
 - 7. Electric operation.
 - 8. Mounting: Within framed opening.

2.02 MATERIALS AND COMPONENTS

- A. Curtain Construction: Interlocking slats.

1. Slat Ends: Each slat fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
 2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
 3. Weatherstripping: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
- B. Steel Slats: Minimum thickness, 16 gage, [] inch; ASTM A653/A653M galvanized steel sheet.
- C. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.
- D. Guides - Angle: ASTM A36/A36M metal angles, size as indicated.
1. Hot-dip galvanized in compliance with ASTM A123/A123M.
- E. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
- F. Lock Hardware:
1. For motor operated units, additional lock or latching mechanisms are not required.
- G. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.03 ELECTRIC OPERATION

- A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
1. Provide interlock switches on motor operated units.
- B. Electric Operators:
1. Mounting: Side mounted.
2. Motor Enclosure:
a. Exterior Coiling Doors: NEMA MG 1, Type 4; open drip proof.
3. Motor Rating: 1/2 hp; continuous duty.
4. Motor Voltage: 120 volts, single phase, 60 Hz.
5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
6. Controller Enclosure: NEMA 250, Type 1.
7. Opening Speed: 12 inches per second.
8. Brake: Adjustable friction clutch type, activated by motor controller.
9. Manual override in case of power failure.
10. Refer to Section 260583 for electrical connections.
- C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.
- D. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.
1. 24 volt circuit.
2. Surface mounted, at interior door jamb.
3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.
- E. Safety Edge: Located at bottom of coiling door, full width, electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.

- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of electrical service with Section 260583.
- F. Complete wiring from disconnect to unit components.
- G. Install enclosure and perimeter trim.

3.02 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch.
- C. Maximum Variation From Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.03 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.04 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

END OF SECTION 083323

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**SECTION 084313
ALUMINUM-FRAMED STOREFRONTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.

1.02 RELATED REQUIREMENTS

- A. Section 087101 - HARDWARE: Hardware items other than specified in this section.
- B. Section 088000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site 2015.
- B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.
- C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).
- D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- D. Samples: Submit two samples __12__x__12__ inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- G. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Florida.
- B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING (EXTERIOR)

- A. Center-Set Style, Thermally-Broken:
 - 1. Basis of Design: Kawneer; Trifab VersaGlaze 451/451T.
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

2.02 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING (INTERIOR)

- A. Center-Set Style:
 - 1. Basis of Design: Kawneer; Trifab VersaGlaze 450.
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4 1/2 inches deep.
- B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
 - 1. C.R. Laurence Company, Inc; U.S. Aluminum; [____]: www.crl-arch.com/#sle.
 - 2. EFCO, a Pella Company; [____]: www.efcocorp.com/#sle.
 - 3. YKK AP America Inc; [____]: www.ykkap.com/#sle.

2.03 BASIS OF DESIGN -- SWINGING DOORS

- A. Medium Stile, Monolithic Glazing:
 - 1. Basis of Design: Kawneer, Model 350 Medium Stile Entrance.
 - 2. Thickness: 1-3/4 inches.
- B. Medium Stile, Insulating Glazing, Thermally-Broken:
 - 1. Basis of Design: Kawneer, Model 350 Medium Stile Entrance.
 - 2. Thickness: 1-3/4 inches.
- C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
 - 1. C.R. Laurence Company, Inc; U.S. Aluminum; [____]: www.crl-arch.com/#sle.
 - 2. EFCO, a Pella Company; [____]: www.efcocorp.com/#sle.
 - 3. YKK AP America Inc; [____]: www.ykkap.com/#sle.

2.04 STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Finish: Class II color anodized.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
 - 2. Finish Color: dark bronze.
 - 3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.

4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
9. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.

2.05 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior.
 1. Glazing Stops: Flush.
 2. Cross-Section: As indicated on drawings.
- B. Glazing: As specified in Section 088000.

2.06 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209 (ASTM B209M).
- C. Fasteners: Stainless steel.
- D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.07 FINISHES

- A. Class II Color Anodized Finish: AAMA 611 AA-M12C22A34 Electrolytically deposited colored anodic coating not less than 0.4 mils thick.

2.08 HARDWARE

- A. Other Door Hardware: As specified in Section 087101.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Install hardware using templates provided.
 - 1. See Section 087101 for hardware installation requirements.
- J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.06 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 084313

**SECTION 084413
GLAZED ALUMINUM CURTAIN WALLS**

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping: Firestop at system junction with structure.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.
- D. Samples: Submit two samples 12 by 12 inches in size illustrating finished aluminum surface, glazing, infill panels, and glazing materials.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- F. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.
- G. Structural Sealant Glazing (SSG): Submit product data and calculations showing compliance with performance requirements.
- H. Field Quality Control Submittals: Report of field testing for water penetration.
- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Verify that each component is appropriate for use in structural sealant glazing (SSG) application in regards to at least the following properties; size, shape, dimensions, material, self-life, storage conditions, and color.
- B. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum 5 years of documented experience.

1.05 MOCK-UP

- A. See Section 014000 - Quality Requirements, for general requirements for mock-ups.
- B. Locate on-site where directed by Architect; mock-up may remain as part of the Work.
 - 1. Mock up size: 1 frame, 5' wide by 5' high.
 - 2. Field Test: Conduct field test of mock up to determine watertightness in accordance with AAMA 503.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN - CURTAIN WALL SYSTEMS

- A. Wind-Borne-Debris Resistance Tested:
 - 1. Basis of Design: Kawneer 1600 Wall System 1 Curtain Wall.
 - a. Glazing configuration: thermally broken, outside glazed.
 - b. Sight line: 2 -1/2 inches
 - c. System depth: 6 inches

2.02 CURTAIN WALL

- A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Finish: Class II color anodized.
 - a. Factory finish surfaces that will be exposed in completed assemblies.
 - b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
 - 2. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 - 3. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 - 4. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
- B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
 - 1. Movement: Accommodate the following movement without damage to components or deterioration of seals:
 - a. Expansion and contraction caused by 180 degrees F surface temperature.
 - b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12 hour period.
 - c. Movement of curtain wall relative to perimeter framing.
 - d. Deflection of structural support framing, under permanent and dynamic loads.
- C. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.
- D. Thermal Performance Requirements:
 - 1. Condensation Resistance Factor of Framing: 65, minimum, measured in accordance with AAMA 1503.
 - 2. Overall U-value Including Glazing: 0.37 Btu/(hr sq ft deg F), maximum.

2.03 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
- B. Glazing: As specified in Section 088000.

2.04 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209 (ASTM B209M).
- C. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.
- D. Firestopping: As specified in Section 078400.
- E. Structural Sealant Glazing (SSG) Adhesive: Neutral curing, silicone sealant formulated for SSG applications in compliance with ASTM C1184 and structural glazing industry guidelines, ASTM C1401.
 - 1. SSG adhesive in compliance with ASTM C920; Type S - Single-component, Grade NS, Class 50, Use NT, G, and A.
 - 2. Ultimate Tensile Strength: Minimum of 50 psi as determined by test method ASTM C1135 under the following conditions.
 - a. Exposure to air temperatures of 190 degrees F and minus 20 degrees F.
 - b. Water immersion for seven (7) days, minimum.
 - c. Exposure to weathering for 5,000 hours, minimum.
 - 3. Sealant Design Tensile Strength: 20 psi, maximum.
 - 4. Hardness: 20 to 60 with Type A-2 durometer in compliance with test method ASTM C661.
 - 5. SSG sealant tested for compatibility with glazing accessories in compliance with ASTM C1087, tested for accelerated weathering in compliance with ASTM C793, and in compliance with insulating glass secondary sealant design standards of ASTM C1249.
 - 6. Manufacturers:
 - a. Provide product recommended by curtain wall manufacturer.
- F. Weatherseal Sealant: Silicone, with adhesion in compliance with ASTM C794; compatible with glazing accessories.
- G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- H. Glazing Accessories: As specified in Section 088000.

2.05 FINISHES

- A. Color: Dark Bronze.

2.06 PART 3 EXECUTION

2.07 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other related work.
- B. Verify that curtain wall openings and adjoining air and vapor seal materials are ready to receive work of this section.
- C. Verify that anchorage devices have been properly installed and located.

2.08 INSTALLATION

- A. Install curtain wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Install firestopping at each floor slab edge.
- H. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

2.09 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.
- C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

2.10 FIELD QUALITY CONTROL

- A. Provide services of curtain wall manufacturer's field representative to observe for proper installation of system and submit report.
- B. Provide field testing of installed curtain wall system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area as directed by Architect.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
 - 3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
- C. Repair or replace curtain wall components that have failed designated field testing, and retest to verify performance complies with specified requirements.

2.11 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, take care to remove dirt from corners, and wipe surfaces clean.
- C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

2.12 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 084413

**SECTION 084435
PROTECTIVE FRAMED GLAZING ASSEMBLIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior protective framed glazing assembly.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping: Firestop at exterior wall assembly junction with structure.
- B. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- C. Section 087101 - HARDWARE: Hardware installation requirements.
- D. Section 087101 - HARDWARE.

1.03 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site 2015.
- B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- E. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2020.
- F. FM (AG) - FM Approval Guide current edition.
- G. ITS (DIR) - Directory of Listed Products current edition.
- H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.
- I. UL (DIR) - Online Certifications Directory Current Edition.
- J. UL 263 - Standard for Fire Tests of Building Construction and Materials Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide evidence of compliance with fire performance criteria and manufacturer's published product data on framing components, glazing, anchorage and fasteners, and doors, if any.
- C. Design Data: Submit framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations.
- D. Test Reports: Submit results of full-size mock-up testing for criteria other than fire performance. Reports of tests previously performed on the same design are acceptable.
- E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least ten years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

PART 2 PRODUCTS

2.01 INTERIOR PROTECTIVE FRAMED GLAZING ASSEMBLIES

- A. Basis of Design: FireFrames Designer Series by TGP Fire-Rated steel frame series as manufactured by Technical Glass Products.
- B. Provide factory fabricated, factory finished framing members with glazing and related flashings, anchorage and attachment devices.
- C. Fire Performance: Provide hourly fire-resistance-rating as indicated; tested as an assembly including glazing in compliance with ASTM E119 or UL 263 and requirements of local authorities having jurisdiction.
 - 1. Corridor Partition Fire-Rating: 45 min. and 60 min..
 - 2. Acceptable evidence of compliance includes listing by UL (DIR), ITS (DIR), or testing agency acceptable to authorities having jurisdiction.

2.02 COMPONENTS

- A. Framing Members: Formed steel structural members without aluminum cladding and non-combustible thermally-resistive material as required for fire rating.
 - 1. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 - 2. Glazing Stops: Flush.
 - 3. Cross-Section: As indicated on drawings.
 - 4. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

2.03 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Structural Steel Sections: ASTM A36/A36M; shop primed.
- C. Structural Supporting Anchors Attached to Structural Steel: Design for bolted attachment.
- D. Firestopping: See Section 078400.
- E. Sealants Within Fire-Rated Assembly: As required by fire-rating and manufacturer's assembly.
- F. Sealants: See Section 079200 for additional information.
- G. Glazing Gaskets: Type to suit application to achieve fire-rating, weather, moisture, and air infiltration requirements.
- H. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

2.04 DOORS AND HARDWARE

- A. Doors: Glazed aluminum.
 - 1. Basis of Design: Fire-rated, narrow profile aluminum doors and frames; as manufactured by TGP.

2. Rating: 60 min.
 3. Finish: Dark bronze anodized.
- B. Doors: Glazed wood.
1. Basis of Design: Fire-rated, wood doors and frames; as manufactured by TGP.
 2. Rating: 45 min.
 3. Finish: See door schedule.
- C. Door Hardware:
1. Types: See Section 087101.
 2. Finish on Hand-Contacted Items: match building hardware.
- D. Interior Doors:
1. Hinges: Butt type, swing clear; top and bottom.

2.05 FINISHES

- A. Finishing: Apply factory finish to surfaces that will be exposed in completed assemblies.
1. Touch-up surfaces cut during fabrication so that no natural metal surfaces are visible in completed assemblies, including joint edges.
- B. Aluminum Finish: Class II color anodized.
1. Apply factory finish to surfaces that will be exposed in completed assemblies.
 2. Touch-up surfaces cut during fabrication so that no natural aluminum metal surfaces are visible in completed assemblies, including joint edges.
 3. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
- C. Class II Color Anodized Finish: AAMA 611 AA-M12C22A34 Electrolytically deposited colored anodic coating not less than 0.4 mils thick.
- D. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install wall system in accordance with limitations of fire rating and with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Install door hardware using templates provided.
1. See Section 087101 for hardware installation requirements.
- H. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.02 TOLERANCES

- A. Maximum Variation from Plumb: 1/16 inch every 3 feet non-cumulative or 1/2 inch per 100 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.
- C. Sealant Space Between Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.03 ADJUSTING

- A. Adjust doors for smooth operation.

END OF SECTION 084435

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.
2. Sliding doors.
3. Other doors to the extent indicated.

- B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

- C. Related Sections:

1. Division 06 Section "Rough Carpentry".
2. Division 06 Section "Finish Carpentry".
3. Division 08 Section "Operations and Maintenance".
4. Division 08 Section "Door Schedule".
5. Division 08 Section "Hollow Metal Doors and Frames".
6. Division 08 Section "Flush Wood Doors".
7. Division 08 Section "Aluminum-Framed Entrances and Storefronts".

- 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. ANSI/SDI A250.13 - Testing and Rating of Severe Windstorm Resistant Components for Swing Door Assemblies.
3. ASTM E1886 - Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
4. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure difference.

5. ASTM E1996 - Standard specification for performance of exterior windows, curtain walls, doors and storm shutters impacted by Windborne Debris in Hurricanes.
 6. ICC/IBC - International Building Code.
 7. NFPA 70 - National Electrical Code.
 8. NFPA 80 - Fire Doors and Windows.
 9. NFPA 101 - Life Safety Code.
 10. NFPA 105 - Installation of Smoke Door Assemblies.
 11. TAS-201-94 - Impact Test Procedures.
 12. TAS-202-94 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components using Uniform Static Air Pressure.
 13. TAS-203-94 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
 14. 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.
 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.
4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Proof of Qualification: Provide copy of manufacturer(s) Factory Trained Installer documentation indicating proof of status as a qualified installer of Windstorm assemblies.
- E. 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.
- F. 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.

- G. 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.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. 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. Windstorm Assembly Installer Qualifications: Installers are to be factory trained for shop and field installation prior to project bid, and are responsible for commissioning, servicing, and warranting the installed equipment specified for the project. A pre-installation site inspection of the frame and floor conditions shall be conducted by the factory trained installer prior to any Windstorm assembly hardware applied to the opening.
- F. 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.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- G. Hurricane Resistant Exterior Openings (State of Florida including the High Velocity Hurricane Zone (HVHZ)): Provide exterior door hardware as complete and tested assemblies, or component assemblies, including approved doors and frames specified

under Section 081113 "Hollow Metal Doors and Frames", to meet the wind loads, design pressures, debris impact resistance, and glass and glazing requirements as detailed in the current State of Florida building code sections applicable to the Project.

1. Each unit to bear third party permanent label in accordance with the Florida Building Code requirements.
 - H. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
 - I. 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.
 - J. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 3. Review sequence of operation narratives for each unique access controlled opening.
 4. Review and finalize construction schedule and verify availability of materials.
 5. Review the required inspecting, testing, commissioning, and demonstration procedures
 - K. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door 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.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
 - 1. Ten years for mortise locks and latches.
 - 2. Seven years for heavy duty cylindrical (bored) locks and latches.
 - 3. Five years for exit hardware.

4. Five years for manual overhead door closer bodies.
5. Twenty five years for manual overhead door closer bodies.
6. Five years for motorized electric latch retraction exit devices.
7. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles 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.
 - 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. Hager Companies (HA).
 - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
 - c. Stanley Hardware (ST).
- B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
1. Manufacturers:
 - a. Bommer Industries (BO).
 - b. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

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. 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. Hager Companies (HA) - ETW-QC (# wires) Option.

- b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC (# wires) Option.
 - c. Stanley Hardware (ST) - C Option.
 - B. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with 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 Products; ASSA ABLOY Architectural Door Accessories (PE) - SER-QC (# wires) Option.
 - 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 Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
 - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.
 2. Manufacturers:
 - a. Hager Companies (HA) - Quick Connect.
 - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC-C Series.
 - c. Stanley Hardware (ST) - WH Series.

2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
 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. Door Controls International (DC).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).
- B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.
1. Manufacturers:
 - a. Door Controls International (DC).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).
- C. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
 5. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (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.
- 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: Manufacturer's Standard.

C. 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. New System: Key locks to a new key system as directed by the Owner.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. 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).
 - c. Telkee (TK).

2.7 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be

manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ML2000 Series.
 - b. dormakaba Best (BE) - 45H Series.
 - c. Sargent Manufacturing (SA) - 8200 Series.

2.8 ELECTROMECHANICAL LOCKING DEVICES

- A. Electromechanical Cylindrical Locksets, Grade 1 (Heavy Duty): Subject to same compliance standards and requirements as mechanical cylindrical locksets, electrified locksets to be of type and design as specified below.
 1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control and request-to-exit signaling. Unless otherwise indicated, provide electrified locksets standard as fail secure.
 2. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - CL33900 Series.
 - b. dormakaba Best (BE) - 93K EL/EU Series.
 - c. Sargent Manufacturing (SA) - 10G70/71 Series.

2.9 AUXILIARY LOCKS

2.10 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.

4. Dustproof Strikes: BHMA A156.16.

2.11 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
4. 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.
5. 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.
6. 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.
7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

11. Hurricane and Tornado Resistance Compliance: Conventional exit devices are to be U.L. listed for windstorm assemblies where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
 1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
 - b. Sargent Manufacturing (SA) - 80 Series.
 - c. Von Duprin (VD) - 35A/98 XP Series.

2.12 ELECTROMECHANICAL EXIT DEVICES

- A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.
 1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
 2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.
 3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
 4. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ED5000 Series.
 - b. Sargent Manufacturing (SA) - 80 Series.
 - c. Von Duprin (VD) - 35A/98 XP Series.

2.13 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 (Large Body Cast Iron): 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. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC8000 Series.
 - b. Norton Door Controls (NO) - 9500 Series.
 - c. Sargent Manufacturing (SA) - 281 Series.
- C. Door Closers, Overhead Concealed (Narrow Profile): ANSI/BHMA 156.4 Grade 1 Certified Products Directory (CPD) listed door closers designed for narrow profile frames and doors. Closers to have fully concealed body in the frame head for offset hung applications, with separate and independent valves for closing speed and backcheck adjustments and a decorative cover plate.
1. Manufacturers:
 - a. LCN Closers (LC) - 2030 Series.
 - b. Rixson Door Controls (RF) - 91DCP Series.

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.
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 certified protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (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 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (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 NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- 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 Products; ASSA ABLOY Architectural Door Accessories (PE).
 - 3. Reese Enterprises, Inc. (RE).

2.17 ELECTRONIC ACCESSORIES

- A. Networked Proximity Card Readers: Card readers to support HID 125 kHz proximity technology and interface with the access control reader modules and door control hardware devices as specified. Card readers to meet the following, minimum, design and performance specifications.
 - 1. Reader to operate on 12VDC or 5VDC power from the reader I/O modules at a maximum current rating of 150 mA per reader.
 - 2. Reader to be weatherproof type when installed in exterior or other wet environments.
 - 3. Reader to communicate with the reader I/O modules using industry standard Wiegand protocol interface.
 - 4. Reader to have multi-color LED display and audible status indications.

5. Reader type and model to meet the design and mounting applications needs of each entry point as indicated on the drawings.
6. Manufacturers (125 kHz Proximity):
 - a. HID Global (HG) - MiniProx 5365/ProxPro II 5455 Series.
- B. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
 1. Manufacturers:
 - a. Securitron (SU) - DPS Series.
- C. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.
 1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
 2. Manufacturers:
 - a. Securitron (SU) - AQL Series.

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.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (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.
 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.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

- B. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RU - Corbin Russwin
4. RO - Rockwood
5. AD - Adams Rite
6. RF - Rixson
7. SU - Securitron

Hardware Sets

Set: 1.0

Doors: D100

Description: EXT PR - ALUM - EAC

1 Continuous Hinge	CFMXXHD1		PE	087100	
1 Continuous Hinge (Elec)	CFMXXHD1 SER		PE	087100	⚡
1 Concealed Vert Rod Exit, Exit Only	ED4800 EO	630	RU	087100	
1 Concealed Vert Rod Exit, Storeroom	ED4800 O859ET M92 MELR	630	RU	087100	⚡
1 Cylinder	As required	626	RU	087100	
2 Door Pull	BF168	US32D	RO	087100	
2 Concealed Closer	91N / PH91 - 90N [special template]	626	RF	087100	
2 Door Stop	480H	US26D	RO	087100	
1 Threshold	2005AT MSES25SS		PE	087100	
1 Gasketing	by door / frame mfg				
1 ElectroLynx Harness	QC-C1500 [PS to hinge]		MK	087100	⚡
1 ElectroLynx Harness	QC-CXXP [Lock / exit to hinge]		MK	087100	⚡
1 Card Reader	SE RP40 / SE RP15 as req			087100	⚡
1 Position Switch	DPS-M/W-WH (as required)		SU	087100	⚡
1 Power Supply	AQLX-E1 - Size as required		SU	087100	⚡

Notes: Hardware listed for design criteria, confirm with specific door manufacturer the hardware requirements to meet specified windstorm rating - Provide 3rd party test results for confirmation.

Set: 1.1

Doors: D100G, DS1001-2

Description: EXT PR - ALUM

2 Continuous Hinge	CFMXXHD1		PE	087100	
1 Concealed Vert Rod Exit, Storeroom	ED4800 O859ET	630	RU	087100	
1 Concealed Vert Rod Exit, Exit Only	ED4800 EO	630	RU	087100	
1 Cylinder	As required	626	RU	087100	

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2 Door Pull	BF168	US32D	RO	087100
2 Concealed Closer	91N / PH91 - 90N [special template]	626	RF	087100
2 Door Stop	480H	US26D	RO	087100
1 Threshold	2005AT MSES25SS		PE	087100
1 Gasketing	by door / frame mfg			

Notes: Hardware listed for design criteria, confirm with specific door manufacturer the hardware requirements to meet specified windstorm rating - Provide 3rd party test results for confirmation.

Set: 2.0

Doors: D100H

Description: EXT CORR - ALUM - EAC

1 Continuous Hinge (Elec)	CFMXXHD1 SER		PE	087100	⚡
1 Rim Exit Device, Nightlatch	ED4200 K157ET M92 MELR	630	RU	087100	⚡
1 Cylinder	As required	626	RU	087100	
1 Door Pull	BF168	US32D	RO	087100	
1 Concealed Closer	91N / PH91 - 90N [special template]	626	RF	087100	
1 Door Stop	480H	US26D	RO	087100	
1 Threshold	2005AT MSES25SS		PE	087100	
1 Gasketing	by door / frame mfg				
1 ElectroLynx Harness	QC-C1500 [PS to hinge]		MK	087100	⚡
1 ElectroLynx Harness	QC-CXXP [Lock / exit to hinge]		MK	087100	⚡
1 Card Reader	SE RP40 / SE RP15 as req			087100	⚡
1 Position Switch	DPS-M/W-WH (as required)		SU	087100	⚡
1 Power Supply	AQLX-E1 - Size as required		SU	087100	⚡

Notes: Door normally closed and secured.

Authorized credential retracts the latchbolt to allow free entry, door relocks upon closing. REX (request to exit) switch in device rail allow for free exit at all times

Entry by key override at all times

Door is fail secure

Hardware listed for design criteria, confirm with specific door manufacturer the hardware requirements to meet specified windstorm rating - Provide 3rd party test results for confirmation.

Set: 3.0

Doors: D129C

Description: EXT BREAK - ALUM

1 Continuous Hinge	CFMXXHD1		PE	087100
1 Deadlatch	4900 X 4591	628	AD	087100
1 Cylinder	As required	626	RU	087100
2 Door Pull	BF168	US32D	RO	087100
1 Concealed Closer	91N / PH91 - 90N [special template]	626	RF	087100
1 Door Stop	480H	US26D	RO	087100
1 Threshold	2005AT MSES25SS		PE	087100
1 Gasketing	by door / frame mfg			
1 Position Switch	DPS-M/W-WH (as required)		SU	087100 ⚡

Notes: Door normally closed and secured.

Authorized credential retracts the latchbolt to allow free entry, door relocks upon closing. REX (request to exit) switch in device rail allow for free exit at all times

Entry by key override at all times

Door is fail secure

Hardware listed for design criteria, confirm with specific door manufacturer the hardware requirements to meet specified windstorm rating - Provide 3rd party test results for confirmation.

Set: 4.0

Doors: D116A

Description: EXT ELEC - PR

8 Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	087100
1 Mullion	CRWS708AKM		RU	087100
1 Rim Exit Device, Exit Only	ED5200 EO M107	630	RU	087100
1 Rim Exit Device, Nightlatch	ED5200 PR957ET M107	630	RU	087100
2 Cylinder	As required	626	RU	087100
2 Surface Closer	DC8210 A11	689	RU	087100
2 Kick Plate	K1050 10" X 2" LDW	US32D	RO	087100
1 Threshold	271A MSES25SS		PE	087100
1 Gasketing	S88D		PE	087100
1 Rain Guard	346C x LAR		PE	087100
2 Sweep	315CN		PE	087100
1 Astragal	S772D [mtg on mull]		PE	087100

2 Position Switch DPS-M/W-WH (as required) SU 087100 ⚡

Notes: Hardware listed for design criteria, confirm with specific door manufacturer the hardware requirements to meet specified windstorm rating - Provide 3rd party test results for confirmation.

Set: 5.0

Doors: [D119A](#)

Description: EXT PR - MEP

6 Hinge, Full Mortise	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK	087100
2 Surface Bolt	988CR		RU	087100
1 Security Storeroom Lock	ML2059 PSA	626	RU	087100
2 Surface Closer	DC8210 A11	689	RU	087100
2 Armor Plate	K1050 36" X 2" LDW	US32D	RO	087100
1 Threshold (Heavy Duty)	2715AK MSES25SS		PE	087100
1 Gasketing	S88D		PE	087100
1 Rain Guard	346C x LAR		PE	087100
2 Sweep	3452AV		PE	087100
1 Astragal	357SP X S88D		PE	087100

Notes: Hardware listed for design criteria, confirm with specific door manufacturer the hardware requirements to meet specified windstorm rating - Provide 3rd party test results for confirmation.

Set: 6.0

Doors: [DS1002-2](#)

Description: EXT STAIR

4 Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	087100
1 Rim Exit Device, Nightlatch	ED5200 PR957ET M107	630	RU	087100
1 Cylinder	As required	626	RU	087100
1 Surface Closer	DC8210 A11	689	RU	087100
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO	087100
1 Threshold	2005AT MSES25SS		PE	087100
1 Gasketing	S88D		PE	087100
1 Rain Guard	346C x LAR		PE	087100
1 Sweep	3452AV		PE	087100
1 Position Switch	DPS-M/W-WH (as required)		SU	087100 ⚡

Notes: Hardware listed for design criteria, confirm with specific door manufacturer the hardware requirements to meet specified windstorm rating - Provide 3rd party test results for confirmation.

Set: 7.0

Doors: [D115A](#)

Description: EXT ELEC

3 Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	087100
1 Rim Exit Device, Nightlatch	ED5200 PR957ET M107	630	RU	087100
1 Cylinder	As required	626	RU	087100
1 Surface Closer	DC8210 A11	689	RU	087100
1 Threshold	271A MSES25SS		PE	087100
1 Gasketing	S88D		PE	087100
1 Rain Guard	346C x LAR		PE	087100
1 Sweep	3452AV		PE	087100

Notes: Hardware listed for design criteria, confirm with specific door manufacturer the hardware requirements to meet specified windstorm rating - Provide 3rd party test results for confirmation.

Set: 8.0

Doors: [D134B](#), [D135A](#)

Description: EXT LAB

3 Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	087100
1 Rim Exit Device, Classroom	ED5200 PR955ET M107	630	RU	087100
1 Cylinder	As required	626	RU	087100
1 Surface Closer	DC8210 A11	689	RU	087100
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO	087100
1 Threshold	271A MSES25SS		PE	087100
1 Gasketing	303AS		PE	087100
1 Rain Guard	346C x LAR		PE	087100
1 Sweep	3452AV		PE	087100

Set: 9.0

Doors: [D131A](#)

Description: EXT SHIP / RECV

4 Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	087100
1 Dormitory Lock	ML2065 PSA	626	RU	087100

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1 Surface Closer	DC8210 A11	689	RU	087100
1 Armor Plate	K1050 36" X 2" LDW	US32D	RO	087100
1 Threshold	271A MSES25SS		PE	087100
1 Gasketing	S88D		PE	087100
1 Rain Guard	346C x LAR		PE	087100
1 Sweep	3452AV		PE	087100
1 Position Switch	DPS-M/W-WH (as required)		SU	087100 ⚡

Notes: Hardware listed for design criteria, confirm with specific door manufacturer the hardware requirements to meet specified windstorm rating - Provide 3rd party test results for confirmation.

Set: 10.0

Doors: DS3002-1

Description: EXT LAB

3 Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	087100
1 Security Storeroom Lock	ML2059 PSA	626	RU	087100
1 Surface Closer	DC8210 A11	689	RU	087100
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO	087100
1 Threshold	271A MSES25SS		PE	087100
1 Gasketing	S88D		PE	087100
1 Rain Guard [Head]	347A X 68AR		PE	087100
1 Gasketing	312CR		PE	087100
1 FL Roof gasket system	Pemko-FLR1		PE	
1 Sweep	3452AV		PE	087100
2 Astragal [Head & Sill]	S771D X LAR		PE	087100

Set: 11.0

Doors: D100A, D100E, D200A, D200D

Description: CORR PR - RATED - EAC

7 Hinge (heavy weight)	T4A3786 4-1/2" x 4-1/2"	US26D	MK	087100
1 Hinge (heavy weight-Elec)	T4A3786 QCXX 4-1/2" x 4-1/2"	US26D	MK	087100 ⚡
1 Fire Rated Surf Vert Rod, Exit Only	ED5470B EO M55	630	RU	087100
1 Fire Rated Surf Vert Rod, Nightlatch	ED5470B PR957ET M55 M92 MELR	630	RU	087100 ⚡
2 Surface Closer	DC8200 / 8210	689	RU	087100
2 Kick Plate	K1050 10" X 2" LDW	US32D	RO	087100

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2 Door Stop	409 / 446 as required	US26D	RO	087100	
1 ElectroLynx Harness	QC-C1500 [PS to hinge]		MK	087100	⚡
1 ElectroLynx Harness	QC-CXXP [Lock / exit to hinge]		MK	087100	⚡
1 Card Reader	SE RP40 / SE RP15 as req			087100	⚡
2 Position Switch	DPS-M/W-WH (as required)		SU	087100	⚡
1 Power Supply	AQLX-E1 - Size as required		SU	087100	⚡

Notes: Door normally closed and secured.
Authorized credential retracts the latchbolt to allow free entry, door relocks upon closing. REX (request to exit) switch in device rail allow for free exit at all times
Entry by key override at all times
Door is fail secure

Set: 12.0

Doors: D120, D125, D127, D134, D230, D232

Description: LAB UN-EQ PR - EAC

7 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100	
1 Hinge, Full Mortise [Elec]	TA2714 QCXX 4-1/2" x 4-1/2"	US26D	MK	087100	⚡
1 Dust Proof Strike	570	US26D	RO	087100	
1 Flush Bolt (Self-latching)	2845 / 2945 (as required)	US26D	RO	087100	
1 Fire Rated Mortise Exit, Classroom	ED5600AL PR9M55ET M92 MELR	630	RU	087100	⚡
1 Cylinder	As required	626	RU	087100	
2 Surface Closer	DC8200 / 8210	689	RU	087100	
1 ElectroLynx Harness	QC-C1500 [PS to hinge]		MK	087100	⚡
1 ElectroLynx Harness	QC-CXXP [Lock / exit to hinge]		MK	087100	⚡
1 Card Reader	SE RP40 / SE RP15 as req			087100	⚡
2 Position Switch	DPS-M/W-WH (as required)		SU	087100	⚡
1 Power Supply	AQLX-E1 - Size as required		SU	087100	⚡

Notes: Presenting a valid credential releases the lever to allow free entry, door relocks upon closing. REX (request to exit) switch in the lock allow for free exit at all times
Entry by key override at all times
Door is fail secure

Set: 13.0

Doors: D131, D135

Description: SHIP / RECV PR - RATED

8 Hinge (heavy weight)	T4A3786 4-1/2" x 4-1/2"	US26D MK 087100
1 Dust Proof Strike	570	US26D RO 087100
1 Flush Bolt (Self-latching)	2845 / 2945 (as required)	US26D RO 087100
1 Classroom Lock	CL3355 PZD	626 RU 087100
1 Coordinator (W/mtg plates)	2672 x Mtg Brkts	Black RO 087100
2 Surface Closer	DC8200 / 8210	689 RU 087100
2 Armor Plate	K1050 36" X 2" LDW	US32D RO 087100
2 Door Stop	409 / 446 as required	US26D RO 087100
1 Gasketing	S88D	PE 087100
1 Astragal	357SP X S88D	PE 087100

Set: 14.0

Doors: D110, D111, D126, D128, D208, D214, D215, D225, D231, D233

Description: LAB PR -EAC

7 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D MK 087100
1 Hinge, Full Mortise [Elec]	TA2714 QCXX 4-1/2" x 4-1/2"	US26D MK 087100 ⚡
1 Dust Proof Strike	570	US26D RO 087100
1 Flush Bolt (Self-latching)	2845 / 2945 (as required)	US26D RO 087100
1 Mortise Exit Device, Classroom	ED5600L PR9M55ET M92 MELR	630 RU 087100 ⚡
1 Cylinder	As required	626 RU 087100
1 Coordinator (W/mtg plates)	2672 x Mtg Brkts	Black RO 087100
2 Surface Closer	DC8200 / 8210	689 RU 087100
2 Mop Plate	K1050 4" X 1" LDW	US32D RO 087100
2 Kick Plate	K1050 10" X 2" LDW	US32D RO 087100
2 Door Stop	409 / 446 as required	US26D RO 087100
1 Gasketing	S88D	PE 087100
1 Astragal	357SP X S88D	PE 087100
1 ElectroLynx Harness	QC-C1500 [PS to hinge]	MK 087100 ⚡
1 ElectroLynx Harness	QC-CXXP [Lock / exit to hinge]	MK 087100 ⚡
1 Card Reader	SE RP40 / SE RP15 as req	087100 ⚡
2 Position Switch	DPS-M/W-WH (as required)	SU 087100 ⚡
1 Power Supply	AQLX-E1 - Size as required	SU 087100 ⚡

Set: 15.0

Doors: DS1001-1, DS1002-1, DS2001-1, DS2002-1

Description: STAIR - RATED

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Fire Rated Rim Exit, Passage	ED5200A PR910ET	630	RU	087100
1 Surface Closer	DC8200 / 8210	689	RU	087100
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO	087100
1 Door Stop	409 / 446 as required	US26D	RO	087100
1 Gasketing	S88D		PE	087100

Set: 16.0

Doors: D121, D123, D226, D228, D234

Description: LAB - RATED - EAC

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Hinge, Full Mortise [Elec]	TA2714 QCXX 4-1/2" x 4-1/2"	US26D	MK	087100 ⚡
1 Electrified Lockset	CL33905 PZD M92	626	RU	087100 ⚡
1 Surface Closer	DC8200 / 8210	689	RU	087100
1 Mop Plate	K1050 4" X 1" LDW	US32D	RO	087100
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO	087100
1 Door Stop	409 / 446 as required	US26D	RO	087100
1 Gasketing	S88D		PE	087100
1 ElectroLynx Harness	QC-C1500 [PS to hinge]		MK	087100 ⚡
1 ElectroLynx Harness	QC-CXXP [Lock / exit to hinge]		MK	087100 ⚡
1 Card Reader	SE RP40 / SE RP15 as req			087100 ⚡
1 Position Switch	DPS-M/W-WH (as required)		SU	087100 ⚡
1 Power Supply	AQLX-E1 - Size as required		SU	087100 ⚡

Set: 17.0

Doors: D100F

Description: CORR PR

6 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Surface Vert Rod Exit, Dummy	ED5470 PR950ET M55	630	RU	087100
1 Surface Vert Rod Exit, Classroom	ED5470 PR955ET M55	630	RU	087100
1 Cylinder	As required	626	RU	087100

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2 Surface Closer	DC8200 / 8210	689	RU	087100
2 Kick Plate	K1050 10" X 2" LDW	US32D	RO	087100
2 Door Stop	409 / 446 as required	US26D	RO	087100
2 Silencer	608		RO	087100

Set: 18.0

Doors: D200E
Description: SERV CORR PR

8 Hinge (heavy weight)	T4A3786 4-1/2" x 4-1/2"	US26D	MK	087100
2 Flush Bolt	555 [12" / 72" AFF]	US26D	RO	087100
1 Dust Proof Strike	570	US26D	RO	087100
1 Classroom Lock	CL3355 PZD	626	RU	087100
2 Surface Closer	DC8200 / 8210	689	RU	087100
2 Armor Plate	K1050 36" X 2" LDW	US32D	RO	087100
2 Door Stop	409 / 446 as required	US26D	RO	087100
1 Gasketing	S88D		PE	087100
1 Astragal	357SP X S88D		PE	087100

Set: 19.0

Doors: D113, D122, D124, D217, D221, D222, D223, D224, D227, D229, D237, D238
Description: LAB - EAC

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Hinge, Full Mortise [Elec]	TA2714 QCXX 4-1/2" x 4-1/2"	US26D	MK	087100 ⚡
1 Classroom Lock	CL3355 PZD	626	RU	087100
2 Surface Closer	DC8200 / 8210	689	RU	087100
2 Mop Plate	K1050 4" X 1" LDW	US32D	RO	087100
2 Kick Plate	K1050 10" X 2" LDW	US32D	RO	087100
2 Door Stop	409 / 446 as required	US26D	RO	087100
1 Gasketing	S88D		PE	087100
1 ElectroLynx Harness	QC-C1500 [PS to hinge]		MK	087100 ⚡
1 ElectroLynx Harness	QC-CXXP [Lock / exit to hinge]		MK	087100 ⚡
1 Card Reader	SE RP40 / SE RP15 as req			087100 ⚡
1 Position Switch	DPS-M/W-WH (as required)		SU	087100 ⚡
1 Power Supply	AQLX-E1 - Size as required		SU	087100 ⚡

Set: 20.0

Doors: D115, D116, D220
Description: ELEC

4 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Rim Exit Device, Nightlatch	ED5200 PR957ET M107	630	RU	087100
1 Cylinder	As required	626	RU	087100
1 Surface Closer	DC8200 / 8210	689	RU	087100
1 Door Stop	409 / 446 as required	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 21.0

Doors: D119
Description: MEP

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Classroom Lock	CL3355 PZD	626	RU	087100
1 Surface Closer	DC8200 / 8210	689	RU	087100
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO	087100
1 Door Stop	409 / 446 as required	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 22.0

Doors: D202
Description: JANITOR

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Classroom Lock	CL3355 PZD	626	RU	087100
1 Surface Closer	DC8200 / 8210	689	RU	087100
1 Mop Plate	K1050 4" X 1" LDW	US32D	RO	087100
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO	087100
1 Door Stop	409 / 446 as required	US26D	RO	087100
1 Gasketing	S88D		PE	087100

Set: 23.0

Doors: D110B, D111B, D120B, D121A, D122A, D123A, D124A, D125B, D126B, D127B, D128B, D203A, D203B, D207, D209, D209B, D210A, D214B, D215B, D225B, D226B, D230B, D231B, D232B, D233B, D238B

Description: LAB / LAB

4 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Institution Lock	CL3332 PZD	626	RU	087100
1 Surface Closer	DC8200 / 8210	689	RU	087100
1 Mop Plate	K1050 4" X 1" LDW	US32D	RO	087100
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO	087100
1 Door Stop	409 / 446 as required	US26D	RO	087100
1 Gasketing	S88D		PE	087100

Set: 24.0

Doors: D134A

Description: SHOP

4 Hinge (heavy weight)	T4A3786 4-1/2" x 4-1/2"	US26D	MK	087100
1 Classroom Lock	CL3355 PZD	626	RU	087100
1 Surface Closer	DC8200 / 8210	689	RU	087100
1 Armor Plate	K1050 36" X 2" LDW	US32D	RO	087100
1 Door Stop	409 / 446 as required	US26D	RO	087100
1 Gasketing	S88D		PE	087100

Set: 25.0

Doors: D236A

Description: BREAK

4 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Passage Latch	CL3310 PZD	626	RU	087100
1 Surface Closer	DC8200 / 8210	689	RU	087100
1 Mop Plate	K1050 4" X 1" LDW	US32D	RO	087100
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO	087100
1 Door Stop	409 / 446 as required	US26D	RO	087100
1 Gasketing	S88D		PE	087100

Set: 26.0

Doors: D108, D130, D212, D235
Description: RESTROOM

3 Hinge (heavy weight)	T4A3786 4-1/2" x 4-1/2"	US26D MK 087100
1 Pull Plate	BF 110 x 70C	US32D RO 087100
1 Push Plate	70C	US32D RO 087100
1 Surface Closer	DC8200 / 8210	689 RU 087100
1 Mop Plate	K1050 4" X 1" LDW	US32D RO 087100
1 Kick Plate	K1050 10" X 2" LDW	US32D RO 087100
1 Door Stop	409 / 446 as required	US26D RO 087100
1 Gasketing	S88D	PE 087100

Set: 27.0

Doors: D100B, D103A, D103B, D106, D109B, D109C, D109D, D109E, D112B, D112C, D112D, D112E, D114B, D114C, D114D, D114E, D213B, D213C, D213D, D213E, D216B, D216C, D216D, D216E, D219B, D219C, D219D, D219E
Description: OFFICE / MULTIPURPOSE - ALUM

1 Continuous Hinge	CFMXXHD1	PE 087100
2 Door Pull	BF168	US32D RO 087100
1 Concealed Closer	91N / PH91 - 90N [special template]	626 RF 087100
1 Door Stop	409 / 446 as required	US26D RO 087100
1 Gasketing	by door / frame mfg	

Notes: Hardware listed for design purposes -

Set: 28.0

Doors: D101, D102, D107, D129A, D129B, D201, D204, D206
Description: CONF / BREAK - ALUM

1 Continuous Hinge	CFMXXHD1	PE 087100
1 Roller Latch	592	US26D RO 087100
2 Door Pull	BF168	US32D RO 087100
1 Door Stop	409 / 446 as required	US26D RO 087100
1 Gasketing	by door / frame mfg	

Notes: Hardware listed for design purposes -

Set: 29.0

Doors: D101A, D109A, D110A, D111A, D112A, D113A, D114A, D117, D117A, D120A, D125A, D126A, D127A, D128A, D132, D202A, D207A, D208A, D209A, D210, D213A, D214A, D215A, D216A, D217A, D218, D219A, D221A, D222A, D223A, D224A, D225A, D226A, D227A, D228A, D229A, D230A, D231A, D232A, D233A, D234A, D237A, D238A

Description: STOR

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D MK 087100
1 Classroom Lock	CL3355 PZD	626 RU 087100
1 Door Stop	409 / 446 as required	US26D RO 087100
3 Silencer	608	RO 087100

Set: 30.0

Doors: D133, D205

Description: JAN

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D MK 087100
1 Classroom Lock	CL3355 PZD	626 RU 087100
1 Mop Plate	K1050 4" X 1" LDW	US32D RO 087100
1 Door Stop	409 / 446 as required	US26D RO 087100
1 Gasketing	S88D	PE 087100

Set: 31.0

Doors: D105

Description: OFFICE

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D MK 087100
1 Entrance Lock	CL3351 PZD	626 RU 087100
1 Door Stop	409 / 446 as required	US26D RO 087100
3 Silencer	608	RO 087100

Set: 32.0

Doors: D118
Description: TOILET

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D MK 087100
1 Privacy Lock	CL3320 PZD	626 RU 087100
1 Mop Plate	K1050 4" X 1" LDW	US32D RO 087100
1 Door Stop	409 / 446 as required	US26D RO 087100
1 Gasketing	S88D	PE 087100

Set: 33.0

Doors: D211
Description: PRINT

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D MK 087100
1 Passage Latch	CL3310 PZD	626 RU 087100
1 Door Stop	409 / 446 as required	US26D RO 087100
3 Silencer	608	RO 087100

Set: 34.0

Doors: D131B, D134C, D135B
Description: OHD

1 HBO All hardware By door mfg

END OF SECTION 087100

SECTION 087113 – AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following types of automatic door operators:
 - 1. Full energy power door operators for swinging doors.
- B. Related Sections:
 - 1. Division 7 Sections for caulking to the extent not specified in this section.
 - 2. [Division 8 Section “Aluminum-Framed Entrances and Storefronts” for entrances furnished separately in Division 8 Section.]
 - 3. [Division 8 Section “Door Hardware” for hardware to the extent not specified in this Section.]
 - 4. Division 26 and 28 Sections for electrical connections including conduit and wiring for automatic entrance door operators and access control devices.

1.2 REFERENCES

- A. References: Refer to 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. CUL – Approved for use in Canada.
 - 4. NFPA 70 - National Electrical Code.
 - 5. NFPA 80 - Fire Doors and Windows.
 - 6. NFPA 101 - Life Safety Code.
 - 7. NFPA 105 - Installation of Smoke Door Assemblies.
- B. American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA).
 - 1. ANSI/BHMA A156.10 American National Standard for Power Operated Pedestrian Doors.
 - 2. ANSI/BHMA A156.19 Standards for Power Assist and Low Energy Power Operated Doors.
- C. Underwriters Laboratories (UL).
 - 1. UL Listed R-9469 Fire Door Operator with Automatic Closer.
 - 2. UL10C – Positive Pressure Fire Tests of Door Assemblies.
 - 3. UL 325 Standard for Safety for Door, Drapery, Gate, Louver and Window Operators and Systems.
 - 4. UL991 Listed - Tests for Safety-Related Controls Employing Solid-State Device.
 - 5. UL244A – Solid – State Controls for Appliances.
 - 6. UL1998 – Software in Programmable Components.
 - 7. UL1310 – Class 2 Power Units.
- D. American Association of Automatic Door Manufacturers (AAADM).
- E. American Society for Testing and Materials (ASTM).
 - 1. ASTM B221 Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
 - 2. ASTM B209 Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

- F. American Architectural Manufacturers Association (AAMA).
 - 1. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.
- G. National Association of Architectural Metal Manufacturers (NAAMM).
 - 1. Metal Finishes Manual for Architectural Metal Products.

1.3 DEFINITIONS

- A. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to activate the operation of the door.
 - 1. Knowing act: Consciously initiating the opening of a power operated door using acceptable methods including wall mounted switches such as push plates and controlled access devices such as keypads, card readers and key switches.
- B. Safety Device: A device that detects the presence of an object or person within a zone where contact could occur and provides a signal to stop the movement of the door.
- C. Double Egress Doors: A pair of doors that swing with the two doors moving in opposite directions and no mullion between them.

1.4 PERFORMANCE REQUIREMENTS

- A. Automatic door equipment accommodates medium to heavy pedestrian traffic.
- B. Opening Force Requirements for Egress Doors: In the event of power failure to the operator, swinging automatic entrance doors shall open with a manual force, not to exceed 30lbf (133N) applied at 1" (25 mm) from the latch edge of the door.
- C. Closing Time:
 - 1. Doors shall be field adjustable to close from 90 degrees to 10 degrees in 2 seconds or longer as applicable per ANSI/BHMA A156.10 standards.
 - 2. Doors shall be field adjusted to close from 10 degrees to fully closed in not less than 1.5 seconds.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, fabrication, operational descriptions and finishes.
- B. Shop Drawings: Submit manufacturer's shop drawings, including elevations, sections and details, indicating dimensions, materials, operator, motion /presence sensor control device, anchors, hardware, finish, options and accessories.
 - 1. Indicate required clearances, and location and size of each field connection.
 - 2. Indicate locations and elevations of entrances showing activation and safety devices.
 - 3. Wiring Diagrams: For power, signal, and activation / safety device wiring.
- C. Samples: Submit manufacturer's samples of aluminum finish.
- D. Manufacturers Field Reports: Submit manufacturer's field reports from AAADM certified technician of inspection and approval of doors for compliance with ANSI/BHMA after completion of installation.

- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the work of this section in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the operators and their nearest service representatives. The final copies delivered after completion of the installation test to include spare parts list.
- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.6 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 10 years of documented experience in manufacturing of doors and equipment of similar to that indicated for this Project and that have a proven record of successful in-service performance. Manufacturer to have a company certificate issued by AAADM.
- B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 3 years documented experience installing and maintenance of units similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Certified Inspector Qualifications: Certified by AAADM.
- D. Source Limitations for Automatic Door Operators: Obtain each type of door, frame, operator and sensor components specified in this Section from a single source, same manufacturer unless otherwise indicated.
- E. Certifications: Operators shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards.
 - 1. ANSI/BHMA A156.10 American National Standard for Power Operated Pedestrian Doors.
 - 2. NFPA 101 - Life Safety Code.
 - 3. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.
 - 4. UL Listed R-9469 Fire Door Operator with Automatic Closer.
- F. Emergency Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrance doors serving as a required means of egress.

1.7 COORDINATION

- A. Coordinate door operators with doors, frames and related work to ensure proper size, thickness, hand, function and finish. Coordinate hardware for automatic entrances with hardware required for rest of the project.
- B. Electrical System Roughing-in: Coordinate layout and installation of power door operators with connections to power supplies and access control system as applicable.

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. Automatic Door Operators shall be free of defects in material and workmanship for a period of one (1) year from the date of substantial completion.

- C. During the warranty period a factory-trained technician shall perform service and affect repairs. An inspection shall be performed after each adjustment or repair.
- D. During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal business hours.
- E. Manufacturer shall have in place a dispatch procedure that shall be available 24 hours a Day, 7 Days a week for emergency call back service.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of design manufacturer: ASSA ABLOY Entrance Systems, 1900 Airport Road, Monroe, NC 28110. Toll Free (877) SPEC-123. Fax (704) 290- 5555 Website www.assaabloyentrance.com contact: specdesk.na.aaes@assaabloy.com
- B. Substitutions: Requests for substitution and product approval in compliance with the specifications must be submitted in writing and in accordance with the procedures outlined in Division 1, Section "Substitution Procedures". Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, as indicated below:
 - 1. Extruded Aluminum, Alloy 6063-T5.

2.3 SWING DOOR OPERATORS

- A. Model: Besam ASSA ABLOY SW200i full energy automatic door operator (Basis of Design):
 - 1. Reference Standard: ANSI/BHMA A156.10.
 - 2. Configuration: Operator to control single swinging doors and pairs of swinging doors as indicated on the drawings and specified below:
 - a. Traffic Pattern: Two way.
 - b. Pairs of Doors: Simultaneous swing.
 - 3. Automatic Door Operator: Electro-mechanical, non-handed operator, powered by 24 volt, 1/4 hp motor. Operator shall be adjustable to compensate for different manual push forces as required.
 - a. Automatic operator shall be capable of operating and controlling up to a 700 pound (317.5 kg) door, 48 inches (1219 mm) in width.
 - b. Overhead Concealed Mounted Operator :
 - 1) Side Access Operator Housing: Operator is contained in a 6 inch (152.4 mm) deep x 6 inch (152.4 mm) high extruded aluminum housing with a hinged cover.
 - 2) Overhead Concealed Mounted Housing: Mounted between door jambs, continuous for full width of door.
 - 3) Hinged Door Connecting Hardware: Overhead concealed mounted operators to have a steel arm from the operator with a sliding track that is mounted to the top face on the approach (push) side of the swing door.
 - c. Operator shall be field switchable between an ANSI/BHMA A156.10 and an ANSI/BHMA A156.19 compliant operator and vice versa. Addition of the activation devices may be required to comply with the applicable standard.

- d. Operator Temperature Range: Capable of operating within temperature ranges of -31° F to 160° F (-35° C to 71° C).
- e. Electrical Characteristics: Maximum power consumption is 300 watts (2.5 amps at 120 VAC), 50/60hz, built-in thermal overload protection.
- 4. Door Operation:
 - a. Opening Cycle The adjustable speed operator mechanically powers the drive shaft and the torque control maintains constant speed throughout the opening cycle regardless of stack pressures or wind speed. Operator shall allow manual door operation with operational forces as indicated to fully open the door applied at 1" (25 mm) from the latch edge of the door.
 - 1) Manual push force shall be adjustable from 5 lbf to 30 lbf maximum.
 - b. Hold Open: The operator shall stop and hold the door open at the selected door opening angle for an adjustable period of time (1.5 seconds to 30 seconds).
 - c. Closing Cycle: Spring close with speed controlled power assist.
 - 1) Upon loss of power, dynamic braking will control the door insuring controlled closing.
 - 2) Selectable Torque Control: Automatically adjusts torque without changing the closing speed of the operator.
 - a) When the torque control is activated, the closing speed shall remain constant regardless of stack pressures or wind speed.
 - b) Torque Cancellation: The torque control is deactivated whenever there is a signal received from door mounted sensors.
 - c) The torque control is disabled during manual use of the door.
 - d. Wind Force Dampening: The operator electromechanically counteracts wind forces, slowing down the door movement to safely open or close the door.
 - e. Stack Pressure Compensation: Operator shall counteract positive stack pressures, negative stack pressures, and sudden changes of stack pressures. The operator never allows the door to open or close faster than the speed control settings, regardless of pressures.
 - f. Obstruction Control: The operator will stop and reverse the door movement.
 - g. Electric Lock Management:
 - 1) Internal module for electrified locking integration.
 - 2) Electric Lock Output: Selectable 12 VDC, maximum 1200 mA / 24 VDC, maximum 600 mA.
 - 3) Lock monitoring prevents operator(s) from opening door(s) until release of electrified lock.
 - 4) Operator pulls door closed before opening, automatically unjamming electric latch hardware.
 - 5) Sequenced operation between operators for pairs of doors allowing lock release and astragal coordination.
 - h. Lock Retry Circuit: If attempt to fully close the door is unsuccessful, the operator will automatically reverse open 10 degrees and reclose in an attempt to successfully close the door.
 - i. Selectable Alarm Reset: The operator can be field set so that after receiving an alarm signal, the operator will not accept any activation impulses and will operate only as a manual door closer until manually reset.
 - j. Electronic Controls: Solid state integrated circuit controls the operation and switching of the swing power operator. The electronic control provides low voltage power supply for all means of actuation. The controls include time delay (1 to 30 seconds) for normal cycle.
 - k. Control Switch: Automatic door operators shall be equipped with the following type of multi-position function switch:
 - 1) [3 position toggle switch remotely mounted (On-Off-Hold).]
- 5. Operator Interface:
 - a. Safety Sensor Integration for overhead presence safety device and door mounted reactivation safety sensors.

2.4 ACTIVATION DEVICES

- A. General: Provide activation devices in accordance with ANSI/BHMA standards, for condition of exposure and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.
- B. Manual Operation:
 - a. Operator shall provide power assist function to the doors to provide ease of manual operation forces.
- C. Secondary Activation Device:
 - 1. Secondary activation: Where activation is by a "knowing act" device, provide a secondary activation sensor as required by ANSI/BHMA A156.10.
- D. Knowing Act Activation Device:
 - 1. Push Plate: Hard wired, 4-1/2 inch square stainless steel push plate switches engraved with "Push to Open" with a blue handicap logo.

2.5 SAFETY DEVICES

- A. General: Provide safety devices in accordance with ANSI/BHMA A156.10 standards, for condition of exposure and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated. Coordinate safety devices with door operation and door operator mechanisms.
- B. Presence Detection Systems and Safety Devices:
 - 1. ASSA ABLOY I-Adapt Premium Safety Sensor System A202 (Basis of Design), Door Mounted Presence Sensor Adaptable Field (DMPS-AF) as specified:
 - a. Door Mounted Presence Sensor Adaptable Field (DMPS-AF): Door mounted combination activation motion sensor/safety presence sensor. Sensor shall be mounted on both the swing (pull) side and the approach (push) side of the door (2 sensors per leaf).
 - 1) Sensor shall utilize active infrared presence technology with auto adapting field to detect moving or stationary presence of people or objects in the swing path of the door.
 - 2) Presence detection shall always be active and remain active when the door is in motion. The sensor provides a full detection pattern that covers the entire swing of the door and also provides detection in the full open and full close position.
 - 3) The sensor has an auto adapting field which maximizes the sensor pattern tailored to the environment providing detection beyond the moving part of the door. The sensor provides detection to the wall and or guide rails ensuring maximum safety resulting in the door stopping much sooner (further) from the person using the doorway.
 - 4) Upon detection the sensor shall provide a signal to slow, stop, or reverse the door action depending on the situation.
 - 5) The sensor provides secondary activation as required for "knowing act" doorways.
 - 6) Since the infrared presence detection is always active, no overhead safety sensor is required.
 - 7) Motion/presence detecting sensors to be field installed and adjusted.

2.6 ACCESSORIES

- A. Guide Rails: Anodized aluminum], fabricated from bars, minimum **30 inches (762 mm)** high, and finished to match doors unless otherwise indicated; positioned and projecting from face of door jamb for distance as indicated, but not less than that required by ANSI/BHMA A156.10 for type of door and direction of travel; with filler panel.
 - 1. Filler Panel: Expanded aluminum mesh.
 - a. Orient expanded aluminum mesh with long dimension of diamonds parallel to top rail.
 - b. Color: To match guide rails.
 - 2. Mounting: Floor, freestanding.
- B. Guide Rail Finishes:
 - 1. [Anodized Finish:]
 - a. AAMA 611, Dark Bronze, AA-M12C22A44, Class I, 0.018 mm.

2.7 ALUMINUM FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Automatic Door Operator Enclosure:
 - 1. Anodized Finish:
 - a. [AAMA 611, Dark Bronze, AA-M12C22A44, Class I, 0.018 mm.]

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, wall and floor construction, and other conditions affecting performance of swinging power operated doors.
- B. Examine roughing-in for electrical source power to verify actual locations of wiring connections.
- C. Proceed only after such discrepancies or conflicts have been resolved.

3.2 INSTALLATION

- A. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints.
- B. Operators: Install automatic door operators plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
 - 1. Install surface mounted hardware using concealed fasteners to greatest extent possible.
 - 2. Set headers, carrier assemblies, tracks, operating brackets and guides level and true to location with anchorage for permanent support.
- C. Door Operators: Connect door operators to electrical power distribution system as specified in Division 26 Sections.

- D. Sealants: Comply with requirements specified in division 7 Section "Joint Sealants" to seal between the operator housing and the adjacent surfaces.
- E. Signage: Apply signage on both sides of each door and sidelite as required by ANSI/BHMA A156.10 and manufacturers installation instructions.

3.3 ADJUSTING

- A. Adjust automatic door operators, controls and hardware for smooth and safe operation and for weather tight closure. Adjust doors in compliance with ANSI/BHMA A156.10.

3.4 FIELD QUALITY CONTROL

- A. Before placing doors into operation, AAADM certified technician shall inspect and approve doors for compliance with ANSI/BHMA A156.10. Certified technician shall be approved by manufacturer.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by automatic door operator installation.
- B. Clean metal surfaces promptly after installation. Remove excess sealants, compounds, dirt and other substances. Repair damages and finish to match original finish.

3.6 DEMONSTRATION

- A. Engage a factory-authorized representative to train Owner's maintenance personnel to adjust, operate, and maintain safe operation of the door.

END OF SECTION

**SECTION 088000
GLAZING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units, monolithic.
- C. Glazing compounds.

1.02 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials current edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test 2010.
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers 2005 (Reapproved 2019).
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- F. ASTM C1036 - Standard Specification for Flat Glass 2011.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2012.
- H. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass 2014.
- I. ASTM C1193 - Standard Guide for Use of Joint Sealants 2013.
- J. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass 2015.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2015a.
- L. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings 2012a.
- M. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation 2010.
- N. GANA (SM) - GANA Sealant Manual 2008.
- O. ICC (IBC) - International Building Code 2015.
- P. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use 1990 (2016).
- Q. ITS (DIR) - Directory of Listed Products current edition.
- R. NFRC 100 - Procedure for Determining Fenestration Product U-factors 2014.
- S. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence 2014.
- T. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems 2014.
- U. UL (DIR) - Online Certifications Directory Current Edition.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data on Insulating Glass Unit, Glazing Unit, Plastic Sheet Glazing Unit, Plastic Film, and [] Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 8 by [] inch in size of glass units.
- E. Certificate: Certify that products of this section meet or exceed specified requirements.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.
- H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least 10 years documented experience.

1.05 MOCK-UPS

- A. Provide on-site glazing mock-up with the specified glazing components.
- B. Locate where directed.

1.06 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.
- C. Laminated Glass: Provide a ten (10) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.
- D. Polycarbonate Sheet Glazing: Provide a ten (10) year manufacturer warranty to include coverage for breakage, coating failure, abrasion resistance, including providing products to replace failed units.
- E. Heat Soaked Tempered Glass: Provide a ten (10) year manufacturer warranty to include coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. AGC Glass North America, Inc; []: www.agcglass.com/#sle.
 - 2. Cardinal Glass Industries; []: www.cardinalcorp.com/#sle.
 - 3. Pilkington North America Inc; []: www.pilkington.com/na/#sle.
 - 4. Vitro Architectural Glass (formerly PPG Glass); []: www.vitroglazings.com/#sle.
- B. Laminated Glass Manufacturers:
 - 1. Cardinal Glass Industries; []: www.cardinalcorp.com/#sle.
 - 2. Viracon, Architectural Glass segment of Apogee Enterprises, Inc; []: www.viracon.com/#sle.
- C. Fire-Resistance-Rated Glass: Provide products as required to achieve indicated fire-rating period.
 - 1. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL: www.safti.com/#sle.

2. Technical Glass Products; Pilkington Pyrostop: www.fireglass.com/#sle.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 3. Glass thicknesses listed are minimum.
- B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
 1. In conjunction with weather barrier related materials described in other sections, as follows:
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 3. Heat-Soak Testing (HST): Provide HST of fully tempered glass used on high-risk or other demanding applications of project, to reduce risks of spontaneous breakage due to nickel sulfide (NiS) induced fractures in accordance with industry established testing requirements.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.04 BASIS OF DESIGN - INSULATING GLASS UNITS

- A. Basis of Design - Insulating Glass Units: Vision glazing, with low-e coating.
 1. Applications: Exterior insulating glass glazing unless otherwise indicated.
 2. Space between lites filled with air.
 3. Total Thickness: 1 inch.
 4. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, nominal.
 5. Visible Light Transmittance (VLT): 53 percent, nominal.
 6. Solar Heat Gain Coefficient (SHGC): 0.23, nominal.
 7. Visible Light Reflectance, Outside: 12 percent, nominal.
 8. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 9. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 10. Metal Edge Spacers: Aluminum, manufacturer's standard corners.
 11. Spacer Color: Black.
 12. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone or polyurethane sealant as secondary seal applied around perimeter.

13. Color: Black.
14. Purge interpane space with argon gas, hermetically sealed.
15. 1" Insulated Glass
 - a. Basis of Design - Solar Ban 90 (2) Acuity Glass by Vitro Architectural Glass: www.vitroglazings.com/#sle.
 - 1) Low-E Coating: Solarban 90 Solar Control sputter coated on second surface.
 - 2) Glass: Clear.
16. 1" Insulated /Tempered Glass
17. Basis of Design - Solar Ban 90 (2) Acuity Glass by Vitro Architectural Glass: www.vitroglazings.com/#sle.
 - a. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - 1) Low-E Coating: Solarban 90 Solar Control sputter coated on second surface..
 - 2) Glass: Clear.
 - 3) Glass Tint: [_____].
 - b. Inboard Lite: Fully tempered float glass, 1/4 inch thick.
 - 1) Coating: No coating on inboard lite.

2.05 GLAZING UNITS

- A. Monolithic Exterior Vision Glazing:
 1. Applications: As scheduled.
 2. Glass Type: Heat-strengthened float glass.
 3. Tint: Clear.
 4. Thickness: 1/4 inch, nominal.
- B. Monolithic Interior Vision Glazing:
 1. Applications: As scheduled.
 2. Glass Type: Annealed float glass.
 3. Tint: Clear.
 4. Thickness: 1/4 inch, nominal.
- C. Monolithic and Tempered Interior Vision Glazing
 1. Applications: As scheduled.
 2. Glass Type: Fully tempered float glass
 3. Tint: Clear.
 4. Thickness: 1/4 inch, nominal.
- D. Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and blocks radiant heat, as required to achieve indicated fire-rating period exceeding 45 minutes.
 1. Applications:
 - a. Glazing in fire-rated door assembly.
 - b. Glazing in fire-rated window assembly.
 - c. Glazing in sidelites, borrowed lites, and other glazed openings in fire-rated wall assemblies.
 2. Glass Type: Multi-laminate annealed glass with intumescent fire retardant interlayers.
 3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
 4. Safety Glazing Certification: 16 CFR 1201 Category II.
 5. Glazing Method: As required for fire rating.
 6. Fire-Rating Period: 60 minutes.
 7. Markings for Fire-Resistance-Rated Glazing Assemblies: Provide permanent markings on fire-resistance-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction.
 - a. "W" - meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.
 - b. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.

- c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
 - d. "T" - meets temperature rise of not more than 450 degrees F above ambient at end of 30 minutes fire exposure in accordance with NFPA 252, UL 10B, or UL 10C fire test standards.
 - e. "XXX" - placeholder that represents fire-rating period, in minutes.
- E. Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve fire-doors indicated fire-rating period of 90 minutes or less.
 - 1. Applications:
 - a. Glazing in fire-rated door assembly.
 - b. Glazing in fire-rated window assembly.
 - c. Other locations as indicated on drawings.
 - 2. Glass Type: Safety ceramic glass.
 - 3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
 - 4. Safety Glazing Certification: 16 CFR 1201 Category II.
 - 5. Glazing Method: As required for fire rating.
 - 6. Fire-Rating Period: As indicated on drawings.
 - 7. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction
 - a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
 - b. "OH" - meets fire window assembly criteria including hose stream test of NFPA 257, or UL 9 fire test standards.
 - c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire tests standards.
 - d. "XXX" - placeholder that represents fire-rating period, in minutes.
- F. Security Glazing: Laminated glass, 2-Ply.
 - 1. Applications: Locations as indicated on drawings.
 - 2. Tint: Clear.
 - 3. Thickness: 9/16 inch.
 - 4. Outer Lite: Heat-strengthened glass.
 - 5. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
 - 6. Inside Lite: Heat-strengthened glass.

2.06 GLAZING COMPOUNDS

- A. Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.
- B. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; [] color.

2.07 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

- D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- C. Verify that sealing between joints of glass framing members has been completed effectively.
- D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 FIELD QUALITY CONTROL

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

3.05 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION 088000

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**SECTION 088300
MIRRORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass mirrors.
 - 1. Annealed float glass.

1.02 REFERENCE STANDARDS

- A. ASTM C1036 - Standard Specification for Flat Glass 2021.
- B. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- C. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror 2018.
- D. GANA (TIPS) - Mirrors: Handle with Extreme Care (Tips for the Professional on the Care and Handling of Mirrors) 2011.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Mirror Glazing: One of each type and size.

1.04 QUALITY ASSURANCE

- A. Fabricate, store, transport, receive, install, and clean mirrors in accordance with recommendations of GANA (TIPS).

1.05 FIELD CONDITIONS

- A. Do not install mirrors when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 MATERIALS

- A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.
- B. Mirror Glass: Clear, annealed float glass; ASTM C1036, with copper and silver coatings, and protective overcoating.
 - 1. Thickness: 1/4 inch.
 - 2. Size: As noted on drawings.

2.03 ACCESSORIES

- A. Mirror Attachment Accessories: Stainless steel clips.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for mirrored glazing are correctly sized and within tolerance.
- B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous mirror frames or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive sealant.
- C. Prepare installation in accordance with ASTM C1193 for solvent release sealants, and install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Install mirrors in accordance with GANA (TIPS) and manufacturers recommendations.
- B. Set mirrors plumb and level, and free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.
- D. Frameless Mirrors: Set mirrors with clips, and anchor rigidly to wall construction.

3.04 CLEANING

- A. Remove labels after work is complete.
- B. Clean mirrors and adjacent surfaces.

END OF SECTION 088300

**SECTION 092116
GYPSUM BOARD ASSEMBLIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Acoustic insulation.
- E. Gypsum sheathing.
- F. Cementitious backing board.
- G. Gypsum wallboard.
- H. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members 2012.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members 2015.
- E. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2017.
- F. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.
- G. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- H. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
- I. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.
- J. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2018.
- K. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2020.
- L. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.
- M. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2017.
- N. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel 2018.
- O. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.
- P. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels 2019.

- Q. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2016.
- R. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).
- S. ASTM E413 - Classification for Rating Sound Insulation 2016.
- T. GA-216 - Application and Finishing of Gypsum Panel Products 2018.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Fire Rated Assemblies: Provide completed assemblies as indicated on drawings.
 - 1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
 - 1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.
 - 2. Marino: www.marinoware.com.
 - 3. Phillips Manufacturing Company: www.phillipsmfg.com.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
 - 1. Studs: "C" shaped with flat or formed webs with knurled faces.
 - 2. Runners: U shaped, sized to match studs.
 - 3. Ceiling Channels: C-shaped, Slotted when connected to deflection - prime structure above.
 - 4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
 - 5. Resilient Furring Channels: 1/2 inch depth, for attachment to substrate through both legs; both legs expanded metal mesh.
 - a. Products:
 - 1) Same manufacturer as other framing materials.
 - 2) Substitutions: See Section 016000 - Product Requirements.
- C. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
 - 1. Products:
 - a. Same manufacturer as other framing materials.
- D. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

- E. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
 - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
 - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot dipped galvanized coating.
 - 3. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings.
 - 4. Deflection and Firestop Track:
 - a. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-rating of the wall assembly.
 - b. Products:
 - 1) FireTrak Corporation; Posi Klip.
 - 2) Metal-Lite, Inc; The System.
- F. Preformed Top Track Firestop Seal:
 - 1. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings.
 - 2. Products:
 - a. Hilti, Inc; Top Track Seal CFS TTS: www.us.hilti.com/#sle.
- G. Non-Loadbearing Framing Accessories:
 - 1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
 - 2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
 - a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
 - 3. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.

2.03 BOARD MATERIALS

- A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 2. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 3. Thickness:
 - a. Vertical Surfaces: 1/2 inch.
 - b. Ceilings: 5/8 inch.
 - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
 - 4. Paper-Faced Products:
 - a. American Gypsum Company; LightRoc Gypsum Wallboard.
 - b. American Gypsum Company; FireBloc Type X Gypsum Wallboard.
 - c. Georgia-Pacific Gypsum; ToughRock.
 - d. Georgia-Pacific Gypsum; ToughRock Fireguard X.
 - e. Substitutions: See Section 016000 - Product Requirements.
- B. Impact Resistant Wallboard:
 - 1. Application: High-traffic areas indicated.
 - 2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
 - 3. Indentation: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
 - 4. Hard Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
 - 5. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 6. Type: Fire resistance rated Type X, UL or WH listed.

7. Thickness: 5/8 inch.
 8. Edges: Tapered.
- C. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in wet areas including tub and shower surrounds.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
 - a. Regular Type: Thickness 1/2 inch.
 - b. Fire Resistant Type: Type X core, thickness 5/8 inch.
 - c. Products:
 - 1) Georgia-Pacific Gypsum; DensShield Tile Backer.
 - 2) National Gypsum Company; Gold Bond eXP Tile Backer.
- D. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
 2. Thickness: 1/2 inch.
 3. Edges: Tapered.
- E. Acoustical Sound Dampening Wall and Ceiling Board: Two layers of heavy paper faced, high density gypsum board separated by a viscoelastic polymer layer and capable of achieving STC rating of 50 or more in typical stud wall assemblies as calculated in accordance with ASTM E413 and when tested in accordance with ASTM E90.
1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
- F. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
1. Application: Exterior sheathing, unless otherwise indicated.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
 4. Core Type: Regular and Type X, as indicated.
 5. Type X Thickness: 5/8 inch.
 6. Regular Board Thickness: 5/8 inch.
 7. Edges: Square.
 8. Glass Mat Faced Products:
 - a. American Gypsum Company; M-Glass Exterior Sheathing Type X.
 - b. American Gypsum Company; M-Glass Exterior Sheathing.
 - c. Georgia-Pacific Gypsum; DensGlass Sheathing.
 - d. Georgia-Pacific Gypsum; DensGlass Fireguard Sheathing.
 - e. Substitutions: See Section 016000 - Product Requirements.
- G. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
1. Paper-Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Products:
 - a. American Gypsum Company; Shaft Liner.
 - b. Georgia-Pacific Gypsum; ToughRock Shaftliner.
 - c. Substitutions: See Section 016000 - Product Requirements.

2.04 ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 inch.

- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
 - 1. Products:
 - a. Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- C. Joint Accessories: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
 - 1. Architectural Reveal Beads:
 - a. Shapes: As indicated on drawings.
 - b. Products:
 - 1) Fryreglet; "F" Reveal Model FDM-625-50 and FDM-625-100 : www.fryreglet.com
 - 2. Expansion Joints:
 - a. Type: V-shaped metal with factory-installed protective tape.
- D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
- E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
- F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

- A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.

3.03 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
 - 1. Level ceiling system to a tolerance of 1/1200.
 - 2. Laterally brace entire suspension system.
 - 3. Install bracing as required at exterior locations to resist wind uplift.
- C. Studs: Space studs as indicated.
 - 1. Extend partition framing to structure where indicated and to ceiling in other locations.
 - 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
 - 3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- E. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 16 inches on center.
 - 1. Spacing: As indicated.
- F. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.

- G. Furring for Fire Ratings: Install as required for fire resistance ratings indicated U.L. Assembly requirements..
- H. Blocking: Install wood blocking for support of:
 - 1. Framed openings.
 - 2. Wall mounted cabinets.
 - 3. Plumbing fixtures.
 - 4. Toilet partitions.
 - 5. Toilet accessories.
 - 6. Wall mounted door hardware.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.
- C. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.05 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
- D. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- E. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
 - 1. Seal joints, cut edges, and holes with water-resistant sealant.
- F. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.
 - 1. Seal joints, cut edges, and holes with water resistant sealant.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.
- D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

3.07 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.

2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 3. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
1. Feather coats of joint compound so that camber is maximum 1/32 inch.
 2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
 3. Taping, filling and sanding is not required at base layer of double layer applications.
- E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
- F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.08 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION 092116

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**SECTION 092216
NON-STRUCTURAL METAL FRAMING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal partition, ceiling, and soffit framing.
- B. Framing accessories.

1.02 REFERENCE STANDARDS

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members 2012.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.
- D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
- E. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2020.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Framing, Connectors, and Accessories:
 - 1. CEMCO; []: www.cemcosteel.com/#sle.
 - 2. ClarkDietrich Building Systems; []: www.clarkdietrich.com/#sle.
 - 3. Jaimes Industries; []: www.jaimesind.com/#sle.
 - 4. Marino; []: www.marinoware.com/#sle.
 - 5. Simpson Strong Tie; []: www.strongtie.com/#sle.
 - 6. Steel Construction Systems; []: www.steelconsystems.com/#sle.
 - 7. Substitutions: See Section 016000 - Product Requirements.

2.02 FRAMING MATERIALS

- A. Fire Rated Assemblies: Comply with applicable code and as indicated on drawings.
- B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
 - 1. Studs: C shaped with flat or formed webs with knurled faces.
 - 2. Runners: U shaped, sized to match studs.
 - 3. Ceiling Channels: C shaped.
 - 4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
 - 5. Resilient Furring Channels: Single or double leg configuration; 1/2 inch channel depth.

- C. Loadbearing Studs: As specified in Section 054000.
- D. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
 - 1. Sound Isolation Clips: Molded rubber isolator and steel clip, fastens directly to framing or structure to provide acoustical separation in gypsum board walls and ceilings.
- E. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
 - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
 - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot dipped galvanized coating.
 - 3. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings.
- F. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.
- G. Sheet Metal Backing: 0.036 inch thick, galvanized.
- H. Anchorage Devices: Powder actuated.
- I. Non-Loadbearing Framing Accessories:
- J. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced.
 - 1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
- K. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
 - 1. Sound Isolation Clips: Molded rubber isolator and steel clip, fastens directly to framing or structure to provide acoustical separation in gypsum board walls and ceilings.
- L. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.
- M. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.
 - 1. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 2. Tape Thickness: 1/4 inch.
- N. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs with provision for crimp locking to stud.
- O. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C754.
- P. Fasteners: ASTM C1002 self-piercing tapping screws.

PART 3 EXECUTION

3.01 INSTALLATION OF STUD FRAMING

- A. Comply with requirements of ASTM C754.
- B. Extend partition framing to structure where indicated and to ceiling in other locations.
- C. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
- D. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- E. Align and secure top and bottom runners at 24 inches on center.
- F. At partitions indicated with an acoustic rating:

1. Place one bead of acoustic sealant between runners and substrate , studs and adjacent construction.
 2. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.
- G. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- H. Install studs vertically at spacing indicated on drawings.
- I. Align stud web openings horizontally.
- J. Stud splicing is not permissible.
- K. Fabricate corners using a minimum of three studs.
- L. Double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings.
- M. Brace stud framing system rigid.
- N. Coordinate erection of studs with requirements of door frames; install supports and attachments.
- O. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- P. Blocking: Use wood blocking secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and opening frames.
- Q. Sound Isolation Clips: Mechanically attach to framing or structure with fasteners recommended by clip manufacturer. Install at spacing indicated on drawings.
- R. Furring: Coordinate with sound isolation clip spacing and locations. Lap splices a minimum of 6 inches.

3.02 CEILING AND SOFFIT FRAMING

- A. Comply with requirements of ASTM C754.
- B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- C. Install furring independent of walls, columns, and above-ceiling work.
- D. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.
- E. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.
- F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- G. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.
- H. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.
- I. Laterally brace suspension system.

3.03 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION 092216

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**SECTION 093000
TILING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Cementitious backer board as tile substrate.
- D. Ceramic accessories.
- E. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

- A. Section 071400 - Fluid-Applied Waterproofing.
- B. Section 079200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- C. Section 092116 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

- A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar 2017.
- B. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar 2017.
- C. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar 1999 (Reaffirmed 2021).
- D. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive 2019.
- E. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar 2020.
- F. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy 1999 (Reaffirmed 2019).
- G. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout 1999 (Reaffirmed 2019).
- H. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout 1999 (Reaffirmed 2019).
- I. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework 2017.
- J. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units 2018.
- K. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium). 2017.
- L. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar 1999 (Reaffirmed 2019).
- M. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone 2005 (Reaffirmed 2021).
- N. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar 2012 (Revised).

- O. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation 2010 (Reaffirmed 2016).
- P. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation 2010 (Reaffirmed 2016).
- Q. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units 1999 (Reaffirmed 2016).
- R. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation 2014.
- S. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation 2014.
- T. ANSI A137.1 - American National Standard Specifications for Ceramic Tile 2021.
- U. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products 2018.
- V. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2021.
- W. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride 2016a.
- X. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 2 percent of each size, color, and surface finish combination.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
- B. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.07 MOCK-UP

- A. See Section 014000 - Quality Requirements, for general requirements for mock-up.
- B. Construct tile mock-up where indicated on drawings, incorporating all components specified for the location.
 - 1. Approved mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.09 FIELD CONDITIONS

- A. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.01 TILE

- A. Porcelain Tile, Type CT-1: ANSI A137.1, standard grade.
 - 1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 - 2. Size: as indicated on drawings.
 - 3. Thickness: 3/8 inch.
 - 4. Edges: Square.
 - 5. Color(s): As indicated on drawings.
 - 6. Pattern: As indicated on drawings.
 - 7. Products:
 - a. As scheduled.
 - b. Substitutions: See Section 016000 - Product Requirements.
- B. Glazed Wall Tile, Type CT-2: ANSI A137.1, standard grade.
 - 1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 - 2. Size: as indicated on drawings.
 - 3. Thickness: 3/8 inch.
 - 4. Edges: Square.
 - 5. Surface Finish: Glazed.
 - 6. Color(s): As indicated on drawings.
 - 7. Pattern: As indicated on drawings.
 - 8. Products:
 - a. Substitutions: See Section 016000 - Product Requirements.
- C. Glazed Wall Tile, Type CT-3: ANSI A137.1, standard grade.
 - 1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 - 2. Size: as indicated on drawings.
 - 3. Edges: Cushioned.
 - 4. Surface Finish: Glazed.
 - 5. Color(s): As indicated on drawings.
 - 6. Pattern: As indicated on drawings.
 - 7. Products:
 - a. As scheduled.
- D. Encaustic Cement Tile, Type CT-4: ANSI A137.1, standard grade.
 - 1. Size: as indicated on drawings.
 - 2. Edges: Square.
 - 3. Surface Finish: Glazed.
 - 4. Color(s): As indicated on drawings.
 - 5. Pattern: As indicated on drawings.
 - 6. Products:
 - a. As scheduled.

2.02 TRIM AND ACCESSORIES

- A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.
- B. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
 - 1. Applications:
 - a. Open edges of wall tile.
 - b. Wall corners, outside.
 - c. Thresholds at door openings.

2. Manufacturers:
 - a. Schluter-Systems: Schluter schiene - www.schluter.com.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.03 SETTING MATERIALS

- A. Manufacturers: provide setting materials by same manufacturer as grout.
- B. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.

2.04 GROUTS

- A. Manufacturers:
 1. Custom Building Products; []: www.custombuildingproducts.com/#sle.
 2. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
 3. Mapei; www.mapei.com/us.
 4. Substitutions: See Section 016000 - Product Requirements.
- B. Commercial Grade Grout:
 1. Applications: use at floor and wall tile locations.
 2. Floor grout joints to be 1/8" wide.

2.05 THIN-SET ACCESSORY MATERIALS

- A. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
 1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
 3. Color(s): To be selected by Architect from manufacturer's full range..

2.06 MAINTENANCE MATERIALS

- A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
 1. Applications: Between tile and plumbing fixtures.
 2. Color(s): As selected by Architect from manufacturer's full line..
- B. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
 1. Composition: Water-based colorless silicone.
- C. Tile Sealer: Stain protection for encaustic cement tile.
 1. Products:
 - a. Miracle Sealants 511 Porous Plus..

2.07 ACCESSORY MATERIALS

- A. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
 1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
 2. Fluid or Trowel Applied Type:
 - a. Material: Synthetic rubber.
 - b. Thickness: 25 mils, minimum, dry film thickness.
 - c. Products:
 - 1) Custom Building Products; RedGard Crack Prevention and Waterproofing Membrane: www.custombuildingproducts.com/#sle.
 - 2) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
 - 3) Substitutions: See Section 016000 - Product Requirements.
- B. Waterproofing Membrane at Showers and Tiled Tubs: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
 1. Fluid or Trowel Applied Type:

- a. Material: Synthetic rubber.
- b. Thickness: 25 mils, minimum, dry film thickness.
- c. Products:
 - 1) LATICRETE International, Inc; LATICRETE HYDRO BAN:
www.laticrete.com/#sle.
- C. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.
- D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.
- E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install ceramic accessories rigidly in prepared openings.
- G. Install non-ceramic trim in accordance with manufacturer's instructions.
- H. Sound tile after setting. Replace hollow sounding units.
- I. Keep control and expansion joints free of mortar, grout, and adhesive.
- J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.

3.05 INSTALLATION - SHOWERS AND BATHTUB WALLS

- A. At shower walls install in accordance with TCNA (HB) Method B412, over cementitious backer units with waterproofing membrane.
- B. Grout with standard grout as specified above.

3.06 INSTALLATION - WALL TILE

- A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms.
- B. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.

3.07 CLEANING

- A. Clean tile and grout surfaces.

3.08 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 093000

**SECTION 095100
ACOUSTICAL CEILINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 REFERENCE STANDARDS

- A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2017.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2019.
- C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2020.
- D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2019.
- E. UL (FRD) - Fire Resistance Directory Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on suspension system components and acoustical units.

1.05 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc: www.armstrong.com/#sle.
- B. Suspension Systems:
 - 1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

- A. Armstrong World Industries, Inc: www.armstrong.com.
- B. Acoustical Units - General: ASTM E1264, Class A.
 - 1. See drawings for product selections.
 - 2. VOC Content: As specified in Section 016116.

2.03 SUSPENSION SYSTEM(S)

- A. Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required. See system descriptions above.

- B. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; heavy-duty.
 - 1. Profile: Tee; 15/16 inch wide face.
 - 2. Construction: Double web.
 - 3. Finish: White painted.
 - 4. Products:
 - a. Armstrong Prelude 15/16" Exposed Tee.
 - b. Substitutions: See Section 016000 - Product Requirements.
- C. Exposed Aluminum Suspension System Type ACT-4: Extruded aluminum; heavy-duty.
 - 1. Profile: Tee; 15/16 inch wide face.
 - 2. Products:

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
- B. Perimeter Moldings: Armstrong Shadow Molding 7874.
 - 1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
 - 2. At Concealed Grid: Provide concealed molding.
- C. Acoustical Insulation: ASTM C665 friction fit type, unfaced batts.
 - 1. Thickness: 2 inch.
 - 2. Size: To fit acoustical suspension system.
- D. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.
- E. Gasket For Perimeter Moldings: Closed cell rubber sponge tape.
- F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
- D. Locate system on room axis according to reflected plan.
- E. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- F. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- I. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- J. Do not eccentrically load system or induce rotation of runners.

- K. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.

3.03 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.
- G. Where round obstructions occur, provide preformed closures to match perimeter molding.
- H. Lay acoustical insulation for a distance of 48 inches either side of acoustical partitions as indicated.

3.04 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 095100

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**SECTION 095426
SUSPENDED WOOD CEILINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Linear wood planks for ceilings and walls.
- B. Metal suspension system.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2017.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2019.
- C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2020.
- D. CISCA (WC) - Wood Ceilings Technical Guidelines 2009.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure ceilings are not installed until building is enclosed, dust generating activities have terminated, and overhead work is completed.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning, attachment of wood ceiling components to grid, accessory attachments, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.
- C. Product Data: Provide data on wood ceiling components and suspension system components.
- D. Samples: Submit two full size samples illustrating material and finish of wood ceiling components.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section.
 - 1. Minimum 3 years documented experience.
- C. Design Criteria: Manufacturer of Linear Closed wood wall and ceiling system LC-1-xxxx-C shall be installed true and plumb to within manufacturing tolerance of 1/8" within 8' of length.
- D. Product Construction: Wood shall be kiln dried to 10%. Cracking, checking and warpage of members will not be acceptable.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood ceiling components to project site in original, unopened packages.
- B. Store in fully enclosed space, flat, level and off the floor.

1.08 FIELD CONDITIONS

- A. Do not install suspended wood ceiling system until wet construction work is complete and permanent heat and air conditioning is installed and operating.
- B. Maintain room temperature between 60 degrees F and 75 degrees F and relative humidity between 35 to 55 percent before, during, and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Suspended Wood Ceilings:
 - 1. Basis of Design: Architectural Components Group Inc; Linear Close Series 1 Wood Wall & Ceiling System: www.acgiwood.com/product_detail/Linear/393

2.02 SUSPENDED WOOD CEILING SYSTEM

- A. Performance Requirements:
 - 1. Design for maximum deflection of 1/360 of span.
- B. Linear Wood Planks: Solid wood.
 - 1. Type: Pre-assembled module of linear planks with battens attached perpendicularly to back of planks.
 - a. Plank Thickness: 3/4 inch.
 - b. Plank Width: 6 inches, nominal.
 - c. Plank Spacing (Reveal): Reveal C by ACGI.
 - d. Species: White Oak.
 - e. Finish: stain to match architect's sample.
- C. Metal Suspension System (Ceilings):
 - 1. General: Comply with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
 - 2. Concealed Suspension System: Hot-dipped galvanized steel grid and cap.
 - a. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
 - b. Profile: Tee; 15/16 inch face width.
 - c. Finish/Color: Baked enamel, black.
 - 3. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement.
- D. Wall Attachment System: per design details provided on the plans.
- E. Accessories: Manufacturer's standard accessories for installation method indicated, above-ceiling accessibility.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Do not install ceiling until after interior wet work is dry.

3.02 PREPARATION

- A. Layout wood ceiling components in pattern according to reflected ceiling plan and as shown on shop drawings.
- B. Acclimate wood ceiling materials by removing from packaging in installation area a minimum of 48 hours prior to installation.

3.03 INSTALLATION

- A. General: Install suspended wood ceiling system in accordance with CISCA (WC).
- B. Suspension System:
 - 1. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
 - 2. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
 - 3. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

4. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
 5. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
 6. Do not eccentrically load system or induce rotation of runners.
- C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
- D. Wood Ceiling:
1. Install wood ceilings in accordance with manufacturer's instructions.
 2. Fit wood components in place, free from damaged edges or other defects detrimental to appearance and function.
 3. Install components in uniform plane, and free from twist, warp, and dents.
 4. Cut to fit irregular grid and perimeter edge trim.
 5. Make field cut edges of same profile as factory edges, seal and finish according to manufacturer.
 6. Install alignment clips at plank joints.

3.04 CLEANING

- A. Clean and touch up minor finish damage. Remove and replace components that cannot be successfully cleaned and repaired.

END OF SECTION 095426

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**SECTION 095800
INTEGRATED CEILING ASSEMBLIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended, modular, non-fire-rated grid system.
- B. Perimeter Trim

1.02 REFERENCE STANDARDS

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method 2017.
- B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2017.
- C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2019.
- D. ASTM E413 - Classification for Rating Sound Insulation 2016.
- E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2020.
- F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2019.
- G. NFPA 13 - Standard for the Installation of Sprinkler Systems Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL (FRD) - Fire Resistance Directory Current Edition.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide descriptions and characteristics of components, finishes, product limitations.
- C. Shop Drawings: Indicate grid layout and dimensions, junctions with other work, relationship of mechanical and electrical items related to ceiling system, other components in the ceiling assembly.
- D. Samples: Submit one acoustical board; one, [_____] inch long piece of metal main grid, cross tee, and perimeter trim; one light fixture with ballast, lens and lamps; one each of supply devices.
- E. Manufacturer's Installation Instructions: Indicate installation sequence and special cautions.
- F. Submit information on adjusting air supply and return devices.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Acoustic Panels: Ten.

1.04 QUALITY ASSURANCE

- A. Grid Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

1.05 MOCK-UP

1.06 FIELD CONDITIONS

- A. Do not install system until building is enclosed, above ceiling work is completed, tested, and approved, and dust generating activities have terminated.
- B. Do not install acoustical units until after wet work has dried.
- C. Maintain minimum temperature of 60 degrees F and maximum relative humidity of 50 percent, 24 hours prior to, during, and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design Acoustical Ceiling System (ACS-1): ACOUSTIBuilt
 - 1. Armstrong World Industries, Inc.; www.armstrongceilings.com/commercial
- B. Basis of Design Acoustic Ceiling Panels (ACB-1): Feltworks Blades
 - 1. Armstrong World Industries, Inc.; www.armstrongceilings.com/commercial
- C. Substitutions: See Section 016000 - Product Requirements.

2.02 INTEGRATED CEILING ASSEMBLIES

- A. Integrated Ceiling Assemblies: Suspension system, panels, trim, and accessories, as indicated and as required for a complete system.
 - 1. Acoustical Ceiling System (ACS) - seamless acoustical ceiling system for interior installations.
 - a. Acoustical Panels
 - 1) Surface Texture: Fine
 - 2) Composition: Mineral Fiber
 - 3) Color: Custom
 - 4) Size: As indic
 - 5) Edge Profile: Tapered edges four sides
 - 6) Noise Reduction Coefficient (NRC): ASTM C 423; Panel 0.80 (UL)
 - 7) Sabin: Cloud Applications: 0.80 Sabins/SF
 - 8) Ceiling Attenuation Class (CAC): ASTM C 1414; Panel 46 (UL)
 - 9) Flame Spread: ASTM E 1264; Class A
 - 10) Dimensional Stability: HumiGuard Plus
 - b. Finish
 - 1) Joint Compound
 - (a) Setting Compound: Lightweight setting-type drywall joint compound
 - (b) Joint Tape: Self-Adhesive mesh drywall joint tape (Panel to Panel)
 - 2) Spray Applied Finish - Required product: #2605WH Fine Texture Finish for ACOUSTIBuilt Panels
 - c. Suspension System
 - 1) All main beams and cross tees shall be commercial quality hot-dipped galvanized steel.
 - (a) Main beam: manufactured main beam- 1-1/2" knurled face with reverse hem by 1 11/16" inches high. Factory punched with corss tee routs, hanger wire holes, and main beam clips. Heavy duty performance per ASTM C635.
 - (b) Cross Tees: manufactured cross tee - 1-1/2" knurled face with reverse hem by 1-1/2" inches high with factory punched cross tee routs and hanger wire holes and stake on clips.
 - 2) Hanger Wire: Class 1 zinc coated, soft tempered, pre-stretched, with a yield stress load of at least three times the design load, but not less than 12-gauge.
 - d. Perimter Systems: Commerical quality extruded aluminum alloy 6603 trim channel, factory finished in baked polymer paint.
 - 2. Acoustic Ceiling Panels (ACP) - linear acoustical felt blade system for interior installations.
 - a. Acoustical Panels
 - 1) Panel profile: 3/8" wide x 10" (55 mm) deep
 - 2) Carrier Module: Custom spacing, as indicated on drawings

- 3) Panel length: standard, field cut as required.
- 4) Panel Profile Type: 3/8" thick non-woven layered and formed polyester felt (PET) with square edge
- 5) Edge Profile: Square edges four sides
- 6) Finish: To be selected from manufacturer's full range
- b. Linear Suspension System
 - 1) Carrier: Roll-formed aluminum section with hook-shaped tabs spaced to receive ceiling panels. Finish: black. Carrier type: Standard
 - 2) Hangers: 12 gauge galvanized carbon steel hanger wire.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that layout of hangers will not interfere with other work.
- C. Verify that required utilities are available, in proper location, and ready for use.

3.02 INSTALLATION - GRID SYSTEM

- A. Install ceiling system in accordance with manufacturers' instructions.
- B. Install hangers and inserts coordinated with overhead work. Provide additional hangers and supports as required.
- C. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- D. Coordinate position of hangers and carrying channels to accommodate fittings and components placed after installation of grid.
- E. Where ducts or other equipment prevent regular spacing of hangers, reinforce adjacent hangers and related support members required to span the distance.
- F. Install grid in accordance with reflected ceiling layout.
- G. Suspend grid independently of walls, columns, ducts, pipes, and conduit. Where grid members are spliced, avoid visible displacement of face plane of adjoining members.
- H. Support light fixture, supply and return air device loads with supplementary hangers located within 6 inches of each component corner when weight of component exceeds the system deflection limits.
- I. Where component installation produces rotation or distortion of runners, provide stabilizer bars or additional support.
- J. Form expansion joints to accommodate 1 inch movement and to maintain visual closure.
- K. Install edge moldings at intersection of ceiling and vertical surfaces and penetrations, using components of maximum length, set level. Provide edge moldings at junction with other ceiling finishes. Miter corners. Provide preformed edge closures to match bullnosed cornered partitions.

3.03 INSTALLATION - COMPONENTS

- A. Install Acoustic Units:
 1. Free from damaged edges or other defects detrimental to appearance and function.
 2. After above-ceiling work is complete.
 3. In uniform plane, and free from twist, warp and dents.
 4. Cut panels to fit irregular grid and perimeter edge trim. Field rabbet panel edge.
- B. Finished Ceiling: Uniform plane, free of soiled or damaged components that are detrimental to appearance or function of system.

3.04 TOLERANCES

- A. Maximum Variation From Flat Plane: 1/8 inch in 10 feet, non-cumulative.
- B. Maximum Offset From True Alignment or Position: 1/8 inch.

3.05 ADJUSTING

- A. Remove sags or twists in ceiling system assembly.

3.06 CLEANING

- A. Clean system components after adjustment and balancing of system has been completed.

3.07 PROTECTION

END OF SECTION 095800

**SECTION 096500
RESILIENT FLOORING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate seaming plans and floor patterns.
- D. Verification Samples: Submit two samples, 4 by 4 inch in size illustrating color and pattern for each resilient flooring product specified.
- E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.
- F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum 5 years documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- D. Protect roll materials from damage by storing on end.
- E. Do not double stack pallets.

1.05 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

- A. Rubber Tile - Type RB-1: Thermoset Rubber Tile, Class I, Grade 1, Type B.
 - 1. Minimum Requirements: Comply with ASTM F1344, of Class corresponding to type specified.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648, NFPA 253, ASTM E 648, or NFPA 253.
 - 3. Size: As indicated on drawings nominal.
 - 4. Total Thickness: 0.125 inch.
 - 5. Texture: Smooth.
 - 6. Color: As indicated on drawings.

2.02 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TP, rubber, thermoplastic; top set Style B, Cove.
 - 1. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 - 2. Thickness: 0.125 inch.
 - 3. Length: Roll.
 - 4. Color and size: As indicated on drawings.
 - 5. Accessories: Premolded external corners and internal corners.

2.03 ACCESSORIES

- A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
 - 1. VOC Content Limits: As specified in Section 016116.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
 - 1. Test in accordance with ASTM F710.
 - 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 - 1. Fit joints and butt seams tightly.
 - 2. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- E. Spread only enough adhesive to permit installation of materials before initial set.
- F. Fit joints and butt seams tightly.
- G. Set flooring in place, press with heavy roller to attain full adhesion.
- H. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 - 1. Resilient Strips: Attach to substrate using adhesive.
- I. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- J. Install flooring in recessed floor access covers, maintaining floor pattern.

3.04 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.
- C. Install loose-laid tile, fit interlocking edges tightly.

3.05 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 096500

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**SECTION 096813
TILE CARPETING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered.

1.02 REFERENCE STANDARDS

- A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials 2016 (Reapproved 2021).
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source 2019a, with Editorial Revision (2020).
- C. CRI 104 - Standard for Installation of Commercial Carpet 2015.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.05 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Tile Carpeting, Type CPT-1: Textured patterned loop, manufactured in one color dye lot.
 - 1. Basis of Design: Mountain Fold by Mannington Commercial.
 - 2. Tile Size: 12" x 36", nominal.
 - 3. Pile Thickness: 0.091 inch.
 - 4. Color: as indicated on drawings.
 - 5. Pattern: Vertical Ashlar.
 - 6. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 - 7. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 - 8. VOC Content: Comply with Section 016116.
 - 9. Gauge: 5/64 inch.
 - 10. Stitches: 10.66 per inch.
 - 11. Pile Weight: 16 oz/sq yd.
 - 12. Primary Backing Material: 100% Synthetic.
 - 13. Fiber System: Type 6, 6 Nylon.

2.02 ACCESSORIES

- A. Edge Strips: Rubber, color as selected by Architect.
- B. Adhesives:
 - 1. Compatible with materials being adhered; maximum VOC content as specified in Section 016116.
- C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
 - 1. Test in accordance with ASTM F710.
 - 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
- F. Locate change of color or pattern between rooms under door centerline.
- G. Fully adhere carpet tile to substrate.
- H. Trim carpet tile neatly at walls and around interruptions.
- I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION 096813

**SECTION 097200
WALL COVERINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation and prime painting.
- B. Wall covering.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

- A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems 2020.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- C. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics 2015.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on wall covering and adhesive.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum 5 years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least 5 years of documented experience.

1.06 WARRANTY

- A. Manufacturer's limited 5-year written warranty against manufacturing defects.

1.07 MOCK-UP

- A. Provide panel, 8 feet wide, full height, illustrating installed wall covering and joint seaming technique.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Inspect roll materials at arrival on site, to verify acceptability.
- B. Protect packaged adhesive from temperature cycling and cold temperatures.
- C. Do not store roll goods on end.

1.09 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.
- B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 PRODUCTS

2.01 WALL COVERINGS

- A. General Requirements:
 - 1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.

2. Chemical and Stain Resistance: No visible staining or discoloration and no damage to surface texture when tested in accordance with ASTM D1308.
- B. Wall Covering - Type VWC: Fabric-backed vinyl roll stock.
 1. Comply with ASTM F793/F793M, Category V, Type II.
 2. Color: as indicated on drawings.
 3. Pattern: as indicated on drawings..
 4. Micro-perforation requirement: All wall covering installed on exterior walls must be factory perforated to allow moisture transmission.
 - C. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.
 - D. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of wall covering manufacturer.
- B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.
- C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.02 PREPARATION

- A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.
- B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.
- C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- D. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

- A. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- B. Apply adhesive to wall surface immediately prior to application of wall covering.
- C. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.
- D. Butt edges tightly.
- E. Do not seam within 2 inches of internal corners or within 6 inches of external corners.
- F. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.
- G. Cover spaces above and below windows, above doors, in pattern sequence from roll.
- H. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches of wall covering termination. Ensure full contact bond.
- I. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

- A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.
- B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

- A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION 097200

**SECTION 098430
SOUND-ABSORBING WALL AND CEILING UNITS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sound-absorbing panels.
- B. Mounting accessories.

1.02 RELATED REQUIREMENTS

- A. Section 095100 - Acoustical Ceilings: Ceiling suspension system.

1.03 REFERENCE STANDARDS

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method 2017.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, panel layout, and fabric orientation.
- D. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company with not less than five years of experience in manufacturing acoustical products similar to those specified.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.
- B. Store units flat, in dry, well-ventilated space; do not stand on end.
- C. Protect edges from damage.

PART 2 PRODUCTS

2.01 FELT SOUND-ABSORBING UNITS

- A. Sound Absorbing Units: 100% Polyethylene Terphthalate (PET) manufactured panels.
 - 1. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 2. Panel Size: 94" x 43"
 - 3. Panel Orientation: Vertical
 - 4. Mounting Method: Direct applied with construction adhesive

2.02 FABRICATION

- A. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

2.03 ACCESSORIES

- A. Panel Adhesive: Acceptable to acoustical panel manufacturer for application as indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.
- B. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
- C. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
 - 1. Plumb and level.
 - 2. Flatness.

3.03 CLEANING

- A. Clean fabric facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.04 PROTECTION

- A. Provide protection of installed acoustical panels until Date of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION 098430

**SECTION 099113
EXTERIOR PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Exposed surfaces of steel lintels and ledge angles.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
 - 6. Floors, unless specifically indicated.
 - 7. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 8. Glass.
 - 9. Concealed pipes, ducts, and conduits.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum 10 years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience and approved by manufacturer.

1.04 MOCK-UP

- A. See Section 014000 - Quality Requirements, for general requirements for mock-up.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
 - 1. PPG Paints: www.ppgpaints.com/#sle.
 - 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
 - 1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 - 2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: Comply with Section 016116.
- C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- D. Colors: To be selected from manufacturer's full range of available colors.
 - 1. Selection to be made by Architect after award of contract.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Paint E-OP - Exterior Surfaces to be Painted, where indicated: concrete.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): Exterior Light Industrial Coating, Water Based; MPI # 163.
 - a. Application: General, all exterior primed metal including exposed structural steel, hollow metal doors and frames.
 - b. Products:
 - 1) PPG Paints Pitt-Tech Plus WB DTM Industrial Enamel, 90-1210 Series, Semi-Gloss. (MPI #163)
 - 3. Top Coat(s): Exterior High Build Latex; MPI #40.
 - a. Application: General, concrete and concrete masonry units.
 - b. Products:
 - 1) PPG Paints Perma-Crete Exterior Acrylic High Build, 4-22 Series.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
 - 1. Interior/Exterior Latex Block Filler; MPI #4.
 - a. Products:
 - 1) Kilz Pro-X p50 Block Filler Primer.

2. Anti-Corrosive Alkyd Primer for Metal; MPI #79.
 - a. Products:
 - 1) PPG Paints Speedhide Interior/Exterior Rust Inhibitive Steel Primer, 6-212 Series. (MPI #79)

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 1. Exterior Plaster and Stucco: 12 percent.
 2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete:
 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi at 6 to 12 inches. Allow to dry.
 3. Clean concrete according to ASTM D4258. Allow to dry.
- G. Masonry:
 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 2. Prepare surface as recommended by top coat manufacturer.
 3. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi at 6 to 12 inches. Allow to dry.
- H. Exterior Plaster: Fill hairline cracks, small holes, and imperfections with exterior patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- I. Galvanized Surfaces:
 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 2. Prepare surface according to SSPC-SP 2.

- J. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- K. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance.
- D. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 099113

**SECTION 099123
INTERIOR PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Elevator pit ladders.
 - 3. Prime surfaces to receive wall coverings.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
 - 6. Marble, granite, slate, and other natural stones.
 - 7. Floors, unless specifically indicated.
 - 8. Ceramic and other tiles.
 - 9. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 10. Glass.
 - 11. Acoustical materials, unless specifically indicated.
 - 12. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2016.
- C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.
- D. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.
- E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
- F. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).
- G. SSPC-SP 2 - Hand Tool Cleaning 2018.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

4. Manufacturer's installation instructions.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 1. Where sheen is specified, submit samples in only that sheen.
 2. Allow 30 days for approval process, after receipt of complete samples by Architect.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 016000 - Product Requirements, for additional provisions.
 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 3. Label each container with color in addition to the manufacturer's label.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum 10 years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 10 years of documented experience.

1.05 MOCK-UP

- A. See Section 014000 - Quality Requirements, for general requirements for mock-up.
- B. Provide panel, 4 feet long by 8 feet wide, illustrating paint color, texture, and finish.
- C. Provide door and frame assembly illustrating paint color, texture, and finish.
- D. Locate where directed by Architect.
- E. Mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer.
 1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
 2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.

- B. Paints:
 - 1. PPG Paints: www.ppgpaints.com/#sle.
 - 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- C. Transparent Finishes:
 - 1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- D. Stains:
 - 1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 2. PPG Paints Deft Interior Clears/Polyurethanes: www.ppgpaints.com/#sle.
- E. Primer Sealers: Same manufacturer as top coats.
- F. Substitutions: See Section 016000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
 - 1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 - 2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 4. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 5. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Architectural coatings VOC limits of Florida.
 - c. USGBC LEED Rating System; for interior wall and ceiling finish (all coats), anti-corrosive paints on interior ferrous metal, sanding sealers, other sealers, and floor coatings.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: As indicated on drawings.

2.03 PAINT SYSTEMS - INTERIOR

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, wood, uncoated steel, shop primed steel, and galvanized steel.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
 - a. Products:
 - 1) PPG Paints Speedhide zero Latex, 6-4310XI Series, Eggshell. (MPI #144)

3. Top Coat Sheen:
 - a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.
 - b. Eggshell: MPI gloss level 3; use this sheen at walls.
 4. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including:
1. Medium duty applications include door frames.
 2. Two top coats and one coat primer.
 3. Top Coat(s): High Performance Architectural Interior Latex; MPI #139, 140, or 141.
 - a. Products:
 - 1) PPG Paints Pitt-Tech Plus WB DTM Industrial Enamel, 90-1210 Series, Semi-Gloss.
 - 2) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Semi-Gloss. (MPI #141)
- C. Paint I-TR -W - Transparent Finish on Wood (Type: M2.1).
1. Stain: Semi-Transparent Stain for Wood; MPI #90.
 - a. Products:
 - 1) Sherwin-Williams Wood Classics 250 VOC Oil Stain. (MPI #90)
 2. Top Coat(s): Clear Lacquer; MPI #85, 86, or 87.
 3. Top Coat Sheen:
 - a. Satin: MPI gloss level 4; use this sheen at all locations.
- D. Paint WI-OP-2L - Wood, Opaque, Latex, 2 Coat (Type P2.1) :
1. One coat of latex primer sealer.
 2. Satin: One coat of latex enamel; Wolf Gordon.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Gypsum Wallboard: 12 percent.
 2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- F. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 - 2. Prepare surface according to SSPC-SP 2.
- G. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- H. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- I. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- J. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
- K. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- D. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- E. Sand wood and metal surfaces lightly between coats to achieve required finish.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 099123

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**SECTION 099600
HIGH-PERFORMANCE COATINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. High performance coatings.
- B. Surface preparation.

1.02 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.
- D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
- E. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1 2016.
- F. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual, Volume 2 2015.
- G. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel 2016.
- H. SSPC-PA 2 - Procedure For Determining Conformance To Dry Coating Thickness Requirements 2015, with Editorial Revision (2018).
- I. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).
- J. SSPC-SP 6 - Commercial Blast Cleaning 2007.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide complete list of all products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified coating system(s) product is to be used in; include description of each system.
- C. Samples: Submit two samples 8 by 8 inch in size illustrating colors available for selection.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Maintenance Data: Include cleaning procedures and repair and patching techniques.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Coating Materials: 1 gallon of each type and color.
 - 2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.04 QUALITY ASSURANCE

- A. Maintain one copy of each referenced document that applies to application on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 10 years documented experience.

- C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

1.05 MOCK-UP

- A. See Section 014000 - Quality Requirements, for general requirements for mock-up.
- B. Locate where directed.
- C. Mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating product manufacturer.
- C. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.
- D. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.
- E. Restrict traffic from area where coating is being applied or is curing.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide high performance coating products from the same manufacturer to the greatest extent possible.
- B. High-Performance Coatings:
 - 1. PPG Paints; [____]: www.ppgpaints.com/#sle.
 - 2. Sherwin-Williams Company; [____]: www.protective.sherwin-williams.com/industries/#sle.
 - 3. Substitutions: Section 016000 - Product Requirements.

2.02 HIGH-PERFORMANCE COATINGS

- A. Provide the following: One top coat and one coat primer.
- B. Note: Certain colors may require multiple coats depending on method of application and finish coat color. When feasible, the preceding coat should be in the same color family (blue, gray, etc.), but noticeably different.
- C. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."

2.03 TOP COAT MATERIALS

- A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.

- B. Epoxy Coating for wet locations:
 - 1. Number of coats: Two.
 - 2. Top Coat(s): High Performance Institutional, Two-Component, Water Based Epoxy Coating; MPI #254.
 - a. Sheen: Eggshell.
 - b. Products:
 - 1) PPG Paints; Pitt-Glaze WB Water-Borne Acrylic Epoxy 16-598 Series, Gloss/16-599 Series, Semi-Gloss: www.ppgpaints.com/#sle.
 - 2) Sherwin-Williams; Pro Industrial Water Based Catalyzed Epoxy; MPI #254: www.protective.sherwin-williams.com/#sle.
- C. Polyurethane Floor Coating for exterior loading dock:
 - 1. Top Coat(s): Industrial Floor Coating, Thin Film; MPI #212.
 - a. Sheen: Gloss.
 - b. Products:
 - 1) PPG Paints; Megaseal HPU HP Urethane Floor Coating, 99-1900 Series: www.ppgpaints.com/#sle.
 - 2) Sherwin-Williams; ArmorSeal HS Polyurethane Floor Enamel; MPI #212: www.protective.sherwin-williams.com/#sle.
 - 3) Substitutions: Section 016000 - Product Requirements.
 - 2. Primer: As recommended by coating manufacturer for specific substrate.
- D. Shellac: Pure, white type.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by coating manufacturer.
 - 1. Primer Sealer, Interior, Institutional Low Odor; MPI #149.
 - a. Products:
 - 1) PPG Paints; Speedhide zero Interior Latex Sealer, 6-4900XI; MPI #149: www.ppgpaints.com/#sle.
 - 2) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Primer; MPI #149: www.protective.sherwin-williams.com/#sle.
 - 2. Block Filler, Epoxy; MPI #116.
 - a. Products:
 - 1) PPG Paints; Amerlock 400 Epoxy Block Filler, 400BF: www.ppgpaints.com/#sle.

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Do not begin application of coatings until substrates have been properly prepared.
- C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
- D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- F. Proceed with coating application only after unacceptable conditions have been corrected.

3.02 PREPARATION

- A. Clean surfaces of loose foreign matter.
- B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.
- C. Remove finish hardware, fixture covers, and accessories and store.
- D. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning", and protect from corrosion until coated.
- E. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING

- A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION

- A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in "MPI Architectural Painting and Specification Manual".
- B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION

- A. Protect finished work from damage.

END OF SECTION 099600

**SECTION 101400
SIGNAGE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Room and door signs.
- B. Plaque.

1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by Owner through Architect prior to fabrication.
- D. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years of documented experience.

1.05 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
 - 1. Sign Type: Flat signs with engraved panel media as specified.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
 - 3. Character Height: 1 inch.
 - 4. Sign Height: See drawings for dimensions.
 - 5. Office Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.

6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers indicated on drawings.
7. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

2.02 SIGN TYPES

- A. Flat Signs: Signage media without frame.
 1. Edges: Square.
 2. Corners: Square.
 3. Clear Cover: For customer produced sign media, provide clear cover of polycarbonate plastic, glossy on back, non-glare on front.
 4. Wall Mounting of One-Sided Signs: Tape adhesive.
- B. Color and Font: Unless otherwise indicated:
 1. Character Font: Helvetica, Arial, or other sans serif font.
 2. Character Case: Upper case only.
 3. Background Color: Clear.
 4. Character Color: Contrasting color.

2.03 TACTILE SIGNAGE MEDIA

- A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
 1. Total Thickness: 1/16 inch.

2.04 PLAQUES

- A. Metal Plaques:
 1. Metal: Aluminum casting.
 2. Metal Sheet Thickness: 3/8" inch, minimum.

2.05 ACCESSORIES

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION 101400

**SECTION 102113.10
SOLID PLASTIC TOILET COMPARTMENTS (STANDARD)**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Solid plastic toilet compartments including the following: (Hiny Hiders)
 - 1. Floor mounted overhead-braced toilet compartments.

1.02 RELATED SECTIONS

- A. Section 05 50 00 - Metal Fabrications.
- B. Section 06 10 00 - Rough Carpentry.

1.03 REFERENCES

- A. ASTM A 666 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- B. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- C. National Fire Protection Association (NFPA) 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
- D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Provide layout drawings and installation details with location and type of hardware required.
- D. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.
- E. Sustainable Design Submittals:
 - 1. Recycled Content: Certify percentages of post-consumer and pre-consumer recycled content.
 - 2. Regional Materials: Certify distance between manufacturer and Project and between manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.
- B. Installer Qualifications: A company regularly engaged in installation of products specified in this Section, with a minimum of 5 years experience.
- C. Materials: Doors, panels and pilasters, constructed from high density polyethylene (HDPE) resins. Partitions to be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments. Cover all plastic components with a protective plastic masking.
- D. Performance Requirements:
 - 1. Fire Resistance: Partition materials shall comply with the following requirements, when tested in accordance with ASTM E 84:
 - a. Class A flame spread/smoke developed rating.

- b. Class B flame spread/smoke developed rating.
- 2. Material Fire Ratings:
 - a. National Fire Protection Association (NFPA) 286: Pass.
 - b. International Code Council (ICC): Class B.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.07 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

- A. Manufacturer guarantees its plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge. Labor not included in warranty.

PART 1 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Scranton Products, which is located at: 801 E. Corey St.; Scranton, PA 18505; Toll Free Tel: 800-445-5148; Fax: 855-376-6161; Email: request info (info@scrantonproducts.com); Web: www.scrantonproducts.com
 - 1. Fabricator: Santana Toilet Partitions.
 - 2. Fabricator: Comtec Toilet Partitions.
 - 3. Fabricator: Capitol Toilet Partitions.
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.02 MATERIAL

- A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface.
 - 1. Recycled Content; Post Industrial: 25 percent.
- B. Zinc Aluminum Magnesium and Copper Alloy (Zamac): ASTM B 86.
- C. Stainless Steel Castings: ASTM A167, Type 304.
- D. Aluminum: ASTM 6463-T5 alloy.

2.03 SOLID PLASTIC TOILET COMPARTMENTS

- A. Basis of Design: Hiny Hiders Toilet Partitions as manufactured by and supplied by Scranton Products.
 - 1. Style: Floor mounted overhead-braced toilet compartments.
- B. Doors, Panels, and Pilasters: 1 inch (25 mm) thick with all edges rounded to a radius. Mount doors and dividing panels based on height of specified system.
 - 1. Door and Panel Height: 66 inches (1676 mm).
 - 2. Panel Edge: Shiplap.
 - 3. Pilasters: 82 inches (2083 mm) high and fastened to floor.
- C. Pilaster Shoes: 4 inches (76 mm) high type 304, 20 gauge stainless steel. Secured to pilasters with a stainless steel tamper resistant Torx head sex bolt.
- D. Headrail: Heavy-duty extruded 6463-T5 alloy aluminum with anti-grip design. Finish to be clear anodized. Fastened to headrail brackets with stainless steel tamper resistant Torx head sex bolt, and fastened at the top of the pilaster with stainless steel tamper resistant Torx head

screws.

1. Headrail Brackets: 20 gauge stainless steel with satin finish. Secured to the wall with stainless steel tamper resistant Torx head screws.
- E. Wall Brackets:
1. Aluminum Brackets: Heavy-duty aluminum 6463-T5 alloy.
 2. Brackets are fastened to pilasters with stainless steel tamper resistant Torx head screws and fastened to the panels with stainless steel tamper resistant Torx head sex bolts.
 3. Bracket Type: Continuous 68 inches (1727 mm) aluminum.
- F. Door Hardware:
1. Provide zero sight-line hardware.
 2. Continuous Aluminum Hinge:
 - a. Length: 65 inches (1651 mm).
 3. Door Strike/Keeper: Heavy-duty extruded aluminum 6436-T5 alloy with a bright dip anodized finish. Secured to pilasters with stainless steel tamper resistant Torx head sex bolts. Bumper shall be made of extruded black vinyl.
 - a. Style: 71 inches (1803 mm) aluminum.
 4. Provide occupancy indicator.
 5. Doors supplied with one coat hook/bumper and door pull made of chrome plated Zamak.
 6. Equip outswing handicapped doors with second door pull and door stop.

2.04 SOLID PLASTIC PRIVACY SCREENS

- A. Provide plastic privacy screens in urinal and entry toilet room applications as indicated or scheduled.
- B. Panels, and pilasters, if required, 1 inch (25 mm) thick with edges rounded to a radius. Screens to be mounted at 14 inches (356 mm) above the finished floor. Color as selected by Architect from manufacturer's full line of current colors.
 1. Recycled content: Minimum 25 percent.
- C. Screen Type: Wall mounted.
 1. Urinal Screens: 24 inches (610 mm) wide by 42 inches (1067 mm) high.

PART 1 EXECUTION

3.01 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.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Examine areas to receive toilet partitions, screens, and shower compartments for correct height and spacing of anchorage/blocking and plumbing fixtures that affect installation of partitions. Report discrepancies to the architect.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install partitions rigid, straight, plumb, and level manor, with plastic laid out as shown on shop drawings.
- C. Clearance at vertical edges of doors shall be uniform top to bottom and shall not exceed 3/8 inch (9.5 mm).
- D. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.

- E. Finished surfaces shall be cleaned after installation and be left free of imperfections.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 102113.10

**SECTION 102601
WALL AND CORNER GUARDS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Corner guards.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, anchorage details, and rough-in measurements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wall and Corner Guards:
 - 1. Basis of Design: Inpro; 130 High Impact: www.inprocorp.com.
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 COMPONENTS

- A. Corner Guards - Surface Mounted:
 - 1. Material: High impact vinylwith full height extruded aluminum retainer.
 - 2. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
 - 3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 4. Width of Wings: 3 inches.
 - 5. Corner: Square.
 - 6. Color: As selected from manufacturer's standard colors.
 - 7. Length: One piece to extend full height of corner.
- B. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.

2.03 FABRICATION

- A. Fabricate components with tight joints, corners and seams.
- B. Pre-drill holes for attachment.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to wall framing members only.

3.03 TOLERANCES

- A. Maximum Variation From Required Height: 1/4 inch.
- B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

END OF SECTION 102601

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**SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Commercial shower and bath accessories.
- C. Accessories for toilet rooms and showers.

1.02 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service 2015a (Reapproved 2019).
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium 2017.
- F. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use 2004, with Editorial Revision (2016).

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. Bradley Corporation; [____]: www.bradleycorp.com.
 - 2. Bobrick Washroom Equipment, Inc.: www.bobrick.com.
 - 3. Substitutions: Section 016000 - Product Requirements.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Stainless Steel Sheet: ASTM A666, Type 304.
- C. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- D. Adhesive: Two component epoxy type, waterproof.
- E. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser: Jumbo roll, surface mounted, for coreless type rolls.
 - 1. Products:
 - a. Georgia-Pacific Professional; Grainger #4DJU8: www.blue-connect.com/#sle.
 - 1) ABS plastic, wall mounted.
 - 2) Color: Translucent smoke.
 - 3) Capacity: 2 - 9" jumbo rolls.
 - (a) Tissue: 1PHJ2 or 1PHJ1
- B. Paper Towel Dispenser, manual operation, surface mounted.
 - 1. Item: high capacity, softPull Roll Towel System as manufactured by Georgia Pacific, Grainger #6HKU8.
 - 2. Capacity: 1,000 foot primary roll plus stub roll.
 - 3. Material: ABS Plastic, translucent smoke.
- C. Waste Receptacle: semi - recessed, stainless steel, seamless lower door for access to container, reinforced panel full height of door, continuously welded bottom pan and seamless exposed flanges.
 - 1. Liner: Removable seamless stainless steel receptacle.
 - 2. Minimum capacity: 2.6 gallons.
- D. Soap Dispenser, surface mounted.
 - 1. Item: Gojo dispenser, FMX, 1250 ML, Grainger #3WU72
 - 2. Color: gray
- E. Grab Bars: Stainless steel, smooth surface.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Length and Configuration: As indicated on drawings.
- F. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

- A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.
- B. Shower Curtain:
 - 1. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
 - 2. Size: 36 by 72 inches, hemmed edges.
 - 3. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
 - 4. Color: White.
 - 5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
- C. Wall-Mounted Soap Dish: Heavy duty, seamless stainless steel, surface-mounted with drain holes, without grab bar, satin finish; with concealed mechanical fastening suitable for substrate and backplate.
- D. Towel Bar: Stainless steel, 3/4 inch square tubular bar; rectangular brackets, concealed attachment, satin finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.

- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated. See drawings.

3.04 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 102800

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**SECTION 104400
FIRE PROTECTION SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.

1.02 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).
- B. FM (AG) - FM Approval Guide current edition.
- C. NFPA 10 - Standard for Portable Fire Extinguishers 2017, with Errata (2018).
- D. UL (DIR) - Online Certifications Directory Current Edition.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

1.04 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Ansul, a Tyco Business; Cleanguard: www.ansul.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp; [____]: www.kidde.com/#sle.
 - 3. Pyro-Chem, a Tyco Business: www.pyrochem.com.
 - 4. Strike First Corporation of America; ABC-Seamless Steel Fire Extinguisher: www.strikefirstusa.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Ansul, a Tyco Business: www.ansul.com.
 - 2. Larsen's Manufacturing Co: www.larsensmfg.com.
 - 3. Pyro-Chem, a Tyco Business: www.pyrochem.com.
 - 4. Strike First Corporation of America; EL-Elite Architectural Series Fire Extinguisher Cabinet, Non-Fire-Rated: www.strikefirstusa.com/#sle.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 - 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Class: A:B:C type.
 - 2. Size: 5 pound.
 - 3. Finish: Baked polyester powder coat, [____] color.

2.03 FIRE EXTINGUISHER CABINETS - INTERIOR

- A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.
- B. Cabinet Construction: Non-fire rated.

- C. Fire Rated Cabinet Construction: One-hour fire rated.
 - 1. Steel; double wall with 5/8 inch thick fire barrier material.
- D. Cabinet Configuration: 1 1-2" square trim, Semi-recessed type.
- E. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with two butt hinge. Provide nylon catch.
- F. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
- G. Door style: Vertical Duo
- H. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- I. Weld, fill, and grind components smooth.
- J. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.
- K. Applied Graphics: Provide applied vinyl lettering as follows: FIRE EXTINGUISHER. Color - black, orientation - vertical.
- L. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure rigidly in place.
- C. Place extinguishers in cabinets.

END OF SECTION 104400

**SECTION 111313
LOADING DOCK BUMPERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Loading dock bumpers of reinforced rubber pads with attachment frame.

1.02 RELATED REQUIREMENTS

- A. Section 031000 - Concrete Forming and Accessories: Placement of loading dock bumper frame anchors into concrete.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on unit dimensions, method of anchorage, and details of construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Loading Dock Bumpers:
 - 1. Blue Giant Equipment Corporation; []: www.bluegiant.com/#sle.
 - 2. Chalfant Sewing Fabricators, Inc; []: www.chalfantusa.com/#sle.

2.02 COMPONENTS

- A. Loading Dock Bumpers: Fabric reinforced rubber pads, ozone resistant, laminated and compressed in position using two galvanized steel rods with threaded ends, washers, and nuts between 3 inch high by 2-1/2 inch wide by 1/4 inch thick galvanized steel angle end plates.
 - 1. Projection From Wall: 4-1/2 inches.
 - 2. Vertical Height: 10 inches.
 - 3. Width: 24 inches.
 - 4. Profile: Rectangular.
- B. Attachment Hardware: 3/4 inches diameter galvanized bolts with expansion shields.
- C. Touch-up Primer: Zinc rich type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that anchor placement is acceptable.

3.02 INSTALLATION

- A. Install dock bumpers in accordance with manufacturer's instructions.
- B. Set plumb and level.
- C. Secure angled end frames to concrete; refer to Section 031000 for additional information.

END OF SECTION 111313

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SECTION 11 53 13 - LABORATORY FUME HOODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Bench-top laboratory fume hoods.
2. Piping and wiring within fume hoods for service fittings, light fixtures, fan switches, and other electrical devices included with fume hoods.
3. Fume hood base cabinets.
4. Fume hood base stands.
5. Work tops within fume hoods.
6. Laboratory gas, and electrical service fittings in fume hoods.

- B. Related Requirements:

1. Section 019113 "General Commissioning Requirements" for information on testing as well as Operations & Maintenance (O&M) Manuals and training of the Owner's personnel.
2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring fume hoods.
3. Section 096513 "Resilient Base and Accessories" for resilient base applied to fume hood base cabinets.
4. Section 123553.13 "Metal Laboratory Casework" for fume hood base cabinets.
5. Section 230595 "Testing, Adjusting, and Balancing for HVAC" for field quality-control testing of fume hoods.
6. Section 233614 "Laboratory Temperature and Airflow Control System" for fume hood temperature and airflow control.
7. Section 262726 "Wiring Devices" for fume hood receptacles and electrical connections.

- C. References:

1. ASHRAE Standard ANSI/ASHRAE 110.2016 – Methods of Testing Performance of Laboratory Fume hoods.
2. ANSI/AIHA Z9.5-2012 Laboratory Ventilation
3. SEFA 1-2010 – Recommended Practices for Laboratory Fume Hoods.
4. OSHA 1910.1450 Occupational Exposure to Hazardous Chemicals in Laboratories.
5. UL 1805 Issued: 2002/06/07 Ed:1 Standard for Laboratory Hoods and Cabinets.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct virtual conference call.

1.4 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements for lateral support of fume hoods.
- B. Coordinate installation of fume hoods with laboratory casework and other laboratory equipment.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For laboratory fume hoods.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Indicate details for anchoring fume hoods to permanent building construction including locations of blocking and other supports.
 - 3. Indicate locations and types of service fittings together with associated service supply connection required.
 - 4. Indicate duct connections, electrical connections, project specific wiring diagrams, and locations of access panels.
 - 5. Include roughing-in information for mechanical, plumbing, and electrical connections.
 - 6. Show adjacent walls, doors, windows, other building components, laboratory casework, and other laboratory equipment. Indicate clearances from the above items.
 - 7. Include layout of fume hoods in relation to lighting fixtures and air-conditioning registers and grilles.
- C. Refer to Section 01 91 13 General Commissioning Requirements for commissioning related submittals and submittal review processes.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Showing compliance with specified performance requirements for as-manufactured containment and static pressure loss, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish complete touchup kit for each type and color of fume hood finish provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged fume hood finish.

1.8 QUALIFICATIONS

- A. The supplier must be a recognized laboratory fume hood manufacturer with a minimum of 5 years of fume hood manufacturing experience and has demonstrated the ability to provide equipment meeting the stated quality standards.

- B. The supplier shall meet all recommended practices of the Scientific Equipment and Furniture Association (SEFA) and more specifically meet the SEFA 1-2010 Laboratory Fume Hood Recommended Practices.

1.9 WARRANTY

- A. The supplier must certify that all components of the laboratory furniture included in this section are guaranteed for a period of one year starting on the date of complete goods shipping.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install fume hoods until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Locate concealed framing, blocking, and reinforcements that support fume hoods by field measurements before being enclosed, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Restricted-Bypass Fume Hoods with VAV Control and Steel Exterior:
 - 1. Bedco Labs. 2305 Francis Hughes Avenue
 - 2. Kewaunee Scientific Corporation. 2700 Front Street. Statesville, NC 28667
 - 3. Mott Manufacturing Ltd. Corporate Headquarters 452 Hardy Road, Brantford ON
- B. Source Limitations: Obtain laboratory fume hoods from single manufacturer.
 - 1. Obtain laboratory fume hoods from same source as laboratory casework.
- C. Product Designations: Drawings indicate sizes, types, and configurations of fume hoods by referencing designated manufacturer's catalog numbers. Other manufacturers' fume hoods of similar sizes, types, and configurations, and complying with the Specifications, may be considered. See Section 016000 "Product Requirements."

2.2 PERFORMANCE REQUIREMENTS

- A. Containment: Provide fume hoods that comply with the following when tested according to ASHRAE 110-2016:
 - 1. As-Manufactured (AM) Rating: AM 0.04 (0.04 ppm).

2. As-Installed (AI) Rating: AI 0.05 (0.05 ppm)
 3. Average Face Velocity: 100 fpm plus or minus with sashes at 18".
 4. Face-Velocity Variation: Not more than 5 percent of average face velocity across the face opening with sashes at 18".
 5. Sash Position: 18"
 - a. Test hoods with horizontal sashes with maximum opening on one side, with maximum opening in the center, and with one opening at each side equal to half of maximum opening.
 6. Release Rate: 4.0 L/min.
 7. Test Setup Modifications: Conduct tests with a minimum of three and a maximum of five people in the test room and with two 1-gal. (3.8-L) round paint cans, one 12-by-12-by-12-inch (300-by-300-by-300-mm) cardboard box, and three 6-by-6-by-12-inch (150-by-150-by-300-mm) cardboard boxes in the fume hood during the test. Position items from 6 to 10 inches (150 to 250 mm) behind the sash, randomly distributed, and supported off the work surface by 2-by-2-inch (50-by-50-mm) blocks.
 8. Walk-by Test: At the conclusion of containment test, execute three rapid walk-bys at 30-second intervals, 12 inches (300 mm) behind the mannequin. Test-gas concentration during each walk-by shall not exceed 0.1 ppm and shall return to specified containment value within 15 seconds.
- B. Static-Pressure Loss: Not more than 1/2-inch wg (124 Pa) at 100-fpm (0.51-m/s) face velocity with sash at 18" when measured at four locations 90 degrees apart around the exhaust duct and at least three duct diameters downstream from duct collar.

2.3 FUME HOODS

- A. Product Standards: Comply with SEFA 1, "Laboratory Fume Hoods - Recommended Practices." Provide fume hoods UL listed and labeled for compliance with UL 1805.
- B. Restricted bypass Fume Hoods: Provide restricted bypass fume hoods where indicated. Partial compensating bypass above the sash opens as sash is closed to less than 20 percent open. Design partial bypass to maintain exhaust capacity of at least 25 cfm per sq.ft. of work surface regardless of sash position.
- C. VAV Control: Refer to section 233614 for fume hood temperature and airflow control.

2.4 MATERIALS

- A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A1008/A1008M; matte finish; suitable for exposed applications.
- B. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- C. Glass-Fiber-Reinforced Polyester: Polyester laminate with a chemical-resistant gel coat on exposed faces and having a flame-spread index of 25 or less according to ASTM E84.
- D. Polypropylene: Unreinforced polypropylene complying with ASTM D4101, Group 01, Class 1, Grade 2.

- E. Glass: Clear, laminated tempered glass complying with ASTM C1172, Kind LT, Condition A, Type I, Class I, Quality-Q3 not less than ¼" total thickness with clear, polyvinyl butyral interlayer.
 - 1. Ultraclear Glass: Glass plies each have visible light transmission not less than 91 percent.
 - 2. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201 for Category II materials.
 - 3. Permanently mark safety glass with certification label of the SGCC Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- F. 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.
- G. Fasteners: Provide stainless steel fasteners where exposed to fumes.

2.5 FABRICATION

- A. General: Assemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations. Fume hoods shall be capable of being partly disassembled as necessary to permit movement through a 48" wide x 84" high door opening.
- B. Dimensions: The hoods shall be designed with the following minimum inside dimensions to maximize working surface: 26 ½ inches working surface depth between the baffles and the sash interior; 48 inches clear height between the working surface and the inside top of the hood. Wall thickness should not exceed 4 ¾" to provide a maximum inner working area.
- C. Steel Exterior: Fabricate from steel sheet, 0.048 inch thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly. The hood structure shall be a double wall construction with steel exterior panels. All steel structural channels, supports, and remote-control faucet mechanisms are installed within the wall structure.
- D. Ends: Fabricate with double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.
- E. Splay top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.
- F. Interior Lining: Provide one of the following unless otherwise indicated:
 - 1. Glass-fiber-reinforced polyester, not less than 3/16 inch thick.
 - 2. Epoxy, not less than 1/4 inch thick.
 - 3. Glass-fiber-reinforced epoxy, not less than 3/16 inch thick.
- G. Lining Assembly: Unless otherwise indicated, assemble with stainless steel fasteners or epoxy adhesive, concealed where possible. Seal joints by filling with chemical-resistant sealant during assembly.
 - 1. Fasten lining components to a rigid frame assembly fabricated from steel and to which exterior panels are attached.

2. Punch fume hood lining side panels to receive service fittings and remote controls. Provide removable plug buttons for holes not used for indicated fittings.
- H. Molded Glass-Fiber-Reinforced Polyester Lining: Molded unit consisting of end panels, back panel, preset rear baffle, and top bonded together into a single piece; reinforced to form a rigid assembly to which exterior is attached.
1. Punch fume hood lining side panels to receive service fittings and remote controls. Provide removable plug buttons for holes not used for indicated fittings.
- I. Rear Baffle: Unless otherwise indicated, provide baffle, of same material as fume hood lining, at rear of hood with openings at top and bottom. Secure baffle to cleats at rear of hood with stainless steel screws. Fabricate baffle for easy removal for cleaning behind baffle.
1. Provide adjustable baffles with remote-control adjustment from outside front of fume hood.
 2. Provide epoxy-coated, stainless steel screen at bottom baffle opening to prevent paper from being drawn into the exhaust plenum behind baffles.
- J. Exhaust Plenum: Full width of fume hood and with adequate volume to provide uniform airflow from hood, of same material as hood lining, and with duct stub for exhaust connection.
1. Duct-Stub Material: stainless steel.
- K. Bypass Grilles: Provide grilles at bypass openings of fume hoods.
- L. Sashes: Provide operable sashes of type indicated.
1. Fabricate from 0.050-inch- (1.27-mm-) thick stainless steel. Form into four-sided frame with bottom corners welded and finished smooth. Make top member removable for glazing replacement. Set glazing in chemical-resistant, U-shaped gaskets.
 2. Glaze with laminated safety glass.
 3. Vertical sash shall be counterbalanced with a single weight to prevent tilting and binding during operation. The sash shall be connected to the counterweight system with two, 1/2" wide steel-reinforced polyurethane notched belts that engage two sprocket shaft drives. The glass panel shall be top hung 1/4" laminated safety float glass.
- M. Airfoil: Unless otherwise indicated, provide airfoil at bottom of fume hood face opening with 1-inch space between airfoil and work top. Sash closes on top of airfoil, leaving 1-inch opening for air intake. Airfoil directs airflow across work top to remove heavier-than-air gases and to prevent reverse airflow.
1. Fabricate airfoil from type 316, 16 gauge stainless steel.
- N. Light Fixtures: Provide vaporproof, LED light fixtures, of longest practicable length; at each fume hood. Shield lights from hood interior with 1/4-inch- (6.35-mm-) thick laminated glass or 3-mm-thick tempered glass, sealed into hood with chemical-resistant rubber gaskets. Provide units with LED fixtures easily replaceable from outside of fume hood.
- O. Filler Strips: Provide as needed to close spaces between fume hoods or fume hood base cabinets and adjacent building construction. Fabricate from same material and with same finish as fume hoods or fume hood base cabinets, as applicable.
- P. Ceiling Extensions: Provide filler panels matching fume hood exterior to enclose space above fume hoods at front and sides of fume hoods and extending from tops of fume hoods to 6" above the ceiling or to a height of 10' minimum at exposed ceiling locations.

- Q. Finished Back Panels: Where rear surfaces of fume hoods are exposed to view, provide finished back panels matching rest of fume hood enclosure.
- R. Comply with requirements in other Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings. Securely anchor fittings, piping, and conduit to fume hoods unless otherwise indicated.

2.6 FUME HOOD BASE CABINETS, BASE STANDS, WORK TOPS, AND SERVICE FITTINGS

- A. Comply with Section 123553.13 "Metal Laboratory Casework." Provide metal base cabinets in finish matching fume hood exterior finish.
- B. Work Tops: Epoxy
 - 1. Work-Top Configuration: Raised (marine) edge with beveled edge and corners.
 - 2. Where acid storage cabinets are indicated beneath fume hoods, provide holes in work tops as need to accommodate cabinet vents.
- C. Service Fittings:
 - 1. Plumbing fittings shall be Water Saver or equivalent.
 - 2. All service fittings are remotely controlled and shall be of one of the following types:
 - a. Front loaded valves
 - b. Rod type valves
 - 3. All components inside the hood chamber shall be finished with an acid and solvent resistant epoxy coating. The remote-controlled handles located on the exterior front post shall be chrome plated.
 - 4. Cup Sink – molded epoxy
- D. Acid Storage Cabinets:
 - 1. Where indicated acid storage cabinets shall use the same gauges of steel and construction features as other base cabinets. In addition, they shall have a one-piece liner insert made of polypropylene. The liner insert shall form a one-inch pan at the bottom to retain spillage. Each door will have a set of louvers at the top and bottom. The door shall be lined with a polyethylene sheet. Each cabinet shall be vented into the fume hood with a 1-1/2" vent pipe. Providing a positive airflow directly into the fume hood exhaust system.
- E. Solvent Storage Cabinets:
 - 1. Solvent storage cabinets shall be UL labeled and specifically designed for the storage of flammable and combustible liquids. Construction shall be based upon the requirements listed by UL, UFC, OSHA, and NFPA No. 30 – 1993. The bottoms, top, sides and doors shall be fabricated of 18" gauge steel and shall be all double panel construction with a 1-1/2" air space between panels. All joints shall be welded, or screwed, to provide a rigid enclosure. The doors shall swing on full-length stainless steel piano hinges and shall be fully insulated. The right hand door shall be equipped with a three point latching device and the left-hand door shall have a full height astragal. The doors are self-closing and synchronized so that both doors will always fully close. The right hand door is equipped with a three-point latching system that automatically engages when the

doors close. Each door is equipped with a fusible-link hold-open feature that will ensure the door closes should the temperature outside the cabinet exceed 165 degrees Fahrenheit. Units 24" long have only one door, self-closing, and equipped with a three-point latching system and hold-open feature. A 2" deep liquid tight pan that covers the entire bottom of the cabinet shall be furnished to contain liquid leaks and spills. A full-depth adjustable shelf is also provided. The shelf is perforated to allow air circulation within the cabinet. Two diametrically opposed vents with spark screens are provided in the back of the cabinet as well as a grounding screw. The cabinet shall have interior finish same as exterior. The cabinet shall be labeled: "FLAMMABLE – KEEP FIRE AWAY".

2.7 CHEMICAL-RESISTANT FINISH

- A. General: Prepare, treat, and finish welded assemblies after welding. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling. Prepare, treat, and finish concealed surfaces same as exposed surfaces.
- B. Preparation: Clean steel surfaces, other than stainless steel, of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- C. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply fume hood manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
 - 1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8M. Acceptance level for chemical spot test shall be no more than four Level 3 conditions. See Section 123553.13 "Metal Laboratory Casework" for additional requirements.
 - 2. Technical Performance:
 - a. Adhesion to substrate: 100% 5B (ASTM D3359)
 - b. Hardness: 3H (ASTM D3363)
 - c. Gloss: 60 +/- 5 units on 60 degrees
 - d. Flexibility: 1/4" Conical Mandrel (ASTM D522)
 - e. Impact resistance: 100 in-lb direct: 100 in-lb reverse (ASTM D2794)
 - f. Corrosion resistance: 1000 hr less 1/16" in creepage over B-1000 treated test panels (ASTM D2247)
 - g. Humidity resistance: 1000 hr no blistering over B-1000 treated test panels (ASTM D2247)
 - 3. Colors for Fume Hood Finish: As selected by Architect from manufacturer's full range.

2.8 ACCESSORIES

- A. Airflow Indicator and Alarm: as specified in Section 23 3614
- B. Airflow Indicator: as specified in Section 23 3614
- C. Airflow Alarm: as specified in Section 23 3614

- D. Sash Alarm: Provide fume hoods with audible and visual alarm that activates when sash is opened beyond preset position.
 - 1. Provide with silence and test switches.
- E. Sash Stops: Provide fume hoods with sash stops to limit hood opening to 50 percent of sash height. Sash stops can be manually released to open sash fully for cleaning fume hood and for placing large apparatus within fume hood.
- F. Bypass Grille Blank-off Panel: Provide fume hoods with blank-off panel on bypass grille designed for use with sash stops to reduce exhaust air volume and provide design face velocity with sash at 50 percent open position.

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 fume hoods.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fume hoods according to manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework. Securely attach access panels but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- B. Comply with requirements in Section 123553.13 "Metal Laboratory Casework" installing fume hood base cabinets, work tops, and sinks.
- C. Comply with requirements for installing water and laboratory gas service fittings and electrical devices.
 - 1. Install fittings according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions. Set bases and flanges of sink and work top-mounted fittings in sealant recommended by manufacturer of sink or work-top material. Securely anchor fittings to fume hoods unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

- A. Field test installed fume hoods according to ASHRAE 110 as modified in "Performance Requirements" Article to verify compliance with performance requirements.
 - 1. Adjust fume hoods, hood exhaust fans, and building's HVAC system, or replace hoods and make other corrections until tested hoods perform as specified.
 - 2. After making corrections, retest fume hoods that failed to perform as specified.

3.4 ADJUSTING AND CLEANING

- A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.
- B. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

3.5 FUME HOOD SCHEDULE

A. Bench-Top Fume Hood Type 6'

- 1. Exterior: Steel with chemical-resistant finish
- 2. Ventilation Type: Restricted bypass, with VAV control.
- 3. ASHRAE 110 As-Manufactured (AM) Rating: AM 0.05 (0.05 ppm)
- 4. ASHRAE 110 As-Installed (AI) Rating: AI 0.10 (0.10 ppm)
- 5. Sash Configuration: Framed
 - a. Operation: Vertical sash.
 - b. Opening Height: 27 to 30 inches
- 6. Work Top: Epoxy.
- 7. Cup Sink: Epoxy, center drain
- 8. Base cabinets: One flammable storage cabinet, one acid storage cabinet, one vacuum storage cabinet.
- 9. Service Fittings:
 - a. Electrical: Two duplex receptacles to match what is required under section 262726 Wiring Devices, switch, and pilot light mounted on exterior front face of end pilaster. Place receptacles and lights on separate dedicated circuits.
 - b. Cold Water – Watersaver L072WSA gooseneck outlet fitting, panel mounted, 6" swing gooseneck with vacuum breaker
 - c. Specialty Gas – Watersaver L022WSA 45 degree angle outlet fitting, panel mounted

B. Bench-Top Fume Hood Type 4'

- 1. Exterior: Steel with chemical-resistant finish
- 2. Ventilation Type: Restricted bypass, with VAV control.
- 3. ASHRAE 110 As-Manufactured (AM) Rating: AM 0.05 (0.05 ppm)
- 4. ASHRAE 110 As-Installed (AI) Rating: AI 0.10 (0.10 ppm)
- 5. Sash Configuration: Framed
 - a. Operation: Vertical sash.
 - b. Opening Height: 27 to 30 inches
- 6. Work Top: Epoxy.
- 7. Cup Sink: Epoxy, center drain
- 8. Base cabinets: One flammable storage cabinet, one vacuum storage cabinet.
- 9. Service Fittings:

- a. Electrical: Two duplex receptacles to match what is required under section 262726 Wiring Devices, switch, and pilot light mounted on exterior front face of end pilaster. Place receptacles and lights on separate dedicated circuits.
- b. Cold Water – Watersaver L072WSA gooseneck outlet fitting, panel mounted, 6” swing gooseneck with vacuum breaker
- c. Specialty Gas – Watersaver L022WSA 45 degree angle outlet fitting, panel mounted

C. ADA Fume Hood Type 4’

1. Exterior: Steel with chemical-resistant finish
2. Ventilation Type: Restricted bypass, with VAV control.
3. ASHRAE 110 As-Manufactured (AM) Rating: AM 0.05 (0.05 ppm)
4. ASHRAE 110 As-Installed (AI) Rating: AI 0.10 (0.10 ppm)
5. Sash Configuration: Framed
 - a. Operation: Vertical sash.
 - b. Opening Height: 27 to 30 inches
6. Work Top: Epoxy.
7. Cup Sink: Epoxy, center drain
8. Base cabinets: none
9. Service Fittings:
 - a. Electrical: Two duplex receptacles to match what is required under section 262726 Wiring Devices, switch, and pilot light mounted on exterior front face of end pilaster. Place receptacles and lights on separate dedicated circuits.
 - b. Cold Water – Watersaver L072WSA gooseneck outlet fitting, panel mounted, 6” swing gooseneck with vacuum breaker
 - c. Specialty Gas – Watersaver L022WSA 45 degree angle outlet fitting, panel mounted

3.6 DEMONSTRATION AND TRAINING

- A. Training of the Owner’s operation and maintenance personnel is required in cooperation with the Owner, the General Contractor, and the Commissioning Professional. Provide competent, factory-authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the Owner and the Commissioning Professional after submission and approval of formal training agendas. Refer to Sections 01 91 13 General Commissioning Requirements.

3.7 FUNCTIONAL PERFORMANCE TESTING

System functional performance testing is part of the Commissioning Process as detailed in Section 01 91 13 General Commissioning Requirements. Functional performance testing shall be performed by the contractor and witnessed and documented by the Commissioning Professional.

END OF SECTION 11 53 13

SECTION 116220 – STERILIZER AUTOCLAVE

PART 1 - GENERAL

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.

2. SUMMARY

- A. Section Includes:

- 1. Prevacuum steam sterilizer
- 2. Optional features for sterilizer
- 3. Accessories for sterilizer

- B. Related Requirements:

- 1. Section 019113 "General Commissioning Requirements" for information on testing as well as Operations & Maintenance (O&M) Manuals and training of the Owner's personnel.
- 2. Section 221118 "Water Distribution System" for information on plumbing requirements.
- 3. Section 233114 "Ductwork" for information on HVAC connections.
- 4. Section 260000 "General Electrical Requirements" for electrical connections.

- C. References:

- 1. Low-Voltage Directive (2014/35/EU)
- 2. EMC Directive (2014/30/EU)
- 3. Machinery Directive (2006/42/EEC)
- 4. Pressure Equipment Directive (PED): 97/23/EC
- 5. ASME, Section VIII American Society of Mechanical Engineers with National Board Registration
- 6. UL/EN/CSA 61010-1, Safety Requirements for Electrical Equipment Measurement, Control, and Laboratory Use Part 1: General Requirements
- 7. UL/EN/CSA 61010-2-040, Safety Requirements for Electrical Equipment Measurement, Control, and Laboratory Use Part 2: Particular Requirements For Sterilizers and Washer-Disinfectors Used To Treat Medical Materials

3. PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct virtual conference call.

4. SYSTEM DESCRIPTION

- A. Sterilizers using steam-under-pressure as the sterilizing agent; designed for sterilization of certain materials used in laboratories and research facilities.

B. Configuration:

1. Prevacuum: Designed for sterilization of porous and nonporous heat- and moisture-stable goods, sterilization of liquids and media in borosilicate glass containers with vented closures, and decontamination of supplies after laboratory procedures. Equipped with prevac, gravity, liquid, Continuous Program (requires power door), Lab waste, USP 660, ATF 1, ATF 2 cycles, leak test, DART and Bowie-Dick test cycles.

5. COORDINATION

- A. Coordinate layout and installation of plumbing and HVAC connections.

6. ACTION SUBMITTALS

- A. Product Data: Describe unit construction, size and finish.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show entire assembly, materials, components, dimensions and gauges.
3. Indicate exhaust ductwork service requirements, electrical connections, project specific wiring diagrams, and locations of access panels.
4. Include roughing-in information for mechanical, plumbing, and electrical connections.
5. Show adjacent walls, doors, windows, other building components. Indicate clearances from the above items.

- C. Refer to Section 01 91 13 General Commissioning Requirements for commissioning related submittals and submittal review processes.

7. INFORMATIONAL SUBMITTALS

- A. Field Service Report.

- B. Source quality-control reports.

- C. Demonstration and Instruction Statement from Owner.

- D. Operation and Maintenance Data: Include parts manual, control diagram, wiring diagrams and procedures for maintenance.

8. QUALIFICATIONS

- A. The supplier must be a recognized laboratory autoclave manufacturer with a minimum of 5 years of autoclave manufacturing experience and has demonstrated the ability to provide equipment meeting the stated quality standards.

9. WARRANTY

- A. The supplier must certify that all components of the laboratory equipment included in this section are guaranteed for a period of one year starting on the date of complete goods shipping. Warranty includes 1 year parts and labor, 15 years on chamber, and 2 years on door gasket.

10. DELIVERY, STORAGE, AND HANDLING

- A. Schedule delivery of laboratory equipment only after wet operations in building are completed.
- B. Provide receiving, distribution, and storage areas of sufficient size and capacity to accommodate crated equipment.
- C. Store laboratory equipment in a ventilated place, protected from the weather, with relative humidity therein of 50% or less at 70 degrees F.
- D. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

11. FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install equipment until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Painting and Other Finishing Trades. At no time shall tradesmen use the installed equipment as a workbench, scaffolding, or other uses. Protect installed laboratory equipment from debris, paint and damage in the course of the construction sequence.

PART 2 - PRODUCTS

1. MANUFACTURERS

- A. STERIS Corporation
- B. Getinge AB

2. PERFORMANCE REQUIREMENTS

- A. Standard Features: Provide sterilizers with the following manufacturer's standard features.
 - 1. Non-Proprietary Control System: To monitor and control all sterilizer operations and functions.
 - 2. Door Design: Medium Sterilizer - Hinged door, manually operated swing-out door design; non-lubricated silicone, steam activated door seal. 60 degree low torque door handle actuation required to lock or unlock door. Small Sterilizer – Vertical sliding door; manual, non-lubricated, steam activated door seal.
 - 3. Modularized Vessel and Piping: Designed to be integral to the sterilizer.

4. Resistance Temperature Detectors (RTD): Installed in chamber drain line and chamber jacket to sense and control temperature variations within the chamber.
 5. Electronic Water Saving Control: Uses a condenser RTD probe to control the amount of water used in condensing exhausted chamber steam.
 6. Software Calibration: For all temperature and pressure inputs.
 7. Connectivity
 - a. USB Port for exporting to a US drive Cycle Usage, Cycle and Calibration Data, Auto-Flush history
 8. Optimal Solution Cooling: To safely cool various liquids in vented, borosilicate glass containers with minimum liquid loss due to boil-over, and to keep normal evaporation below 5 percent.
 9. Automatic Utilities Startup/Shutdown: To shut off all utility valves, permitting slow cooling of the entire vessel and load. Programmed and manual restart options.
 10. Steam Bleed: Constant steam flow supplied across chamber RTD to assure even temperature distribution and temperature control.
 11. Steam Purge: To assist in air removal and to preheat load.
 12. Automatic Steam Shutoff to Jacket: For isothermal and liquid cycles: to allow operation of cycles at lower temperatures and more efficient load cooling.
 13. One-piece Insulation Sleeve: Fitted around exterior of sterilizer vessel. Insulation sleeve consists of 1" thick spin glass temperature rated for 500 degrees F continuous and is covered by an asbestos-free, silicone impregnated, oil and water resistant outer jacket. Outer jacket rated for 500 degrees F.
 14. Control Lockout Switch: Limit switch on chamber door to prevent cycle from starting unless door seal is tight against the door.
 15. Chamber Float Switch: To activate alarm, abort cycle, and safely vent chamber with a controlled exhaust if excessive condensate is detected in vessel chamber.
 16. Pressure Relief Valve: To limit the amount of pressure buildup so that the rated pressure in the vessel is not exceeded.
 17. Chamber Drain System: To prevent pollutants from entering into the water supply system and sterilizer. Automatic stainless steel plate-type condensing system to convert chamber steam to condensate and to dispose it to waste.
 18. Vacuum System: Mechanical vacuum pump to reduce chamber pressure during the prevacuum and post-drying phase. Air to be drawn from the chamber through the vacuum system.
 19. Chamber and jacket pressure gauges are mounted on the load end control panel.
 20. Programmable Green Mode that turns the chamber jacket off after user defined idle time.
 21. Thermal Printer for easy to read printed record of cycle data.
- B. Optional Features: Provide sterilizers with the following manufacturer's optional features.
1. For medium sterilizer - 65 kW+ Carbon Steel Electric Steam Generator tied integrally to sterilizer power and control. Additional floor space required. For small sterilizer – 30 kW integral carbon steel generator.
 2. STERI-Green Water Conservation System. Utilizes a mixing tank and an air-cooled heat exchanger to cool and recycle vacuum pump water and steam effluent. Water temperature is constantly monitored to minimize the need to add fresh cool water to the mixing tank.
 3. Exterior Enclosure: 304L Stainless steel, easily removable side panels and louvered top panel to enclose sterilizer body and piping.
 4. Automatic and programmable flushing system is provided for 65 kw and 30 kW Carbon Steel Electric Steam Generator.

C. CONSTRUCTION

1. Shell Assembly: Two Type 316L stainless steel shells, welded one within the other, to form the sterilizer vessel.
 - a. End Frame(s): Type 316L stainless steel, welded to door end.
 - b. Single door chamber back: Type 316L stainless steel formed head, welded to back of chamber.
 - c. Vessel: ASME rated at 45 psig (3.1 bar).
 - d. Baffle: Shield steam-supply opening inside chamber by a Type 316L stainless steel baffle.
2. Chamber Door Hinged: Type 316L stainless steel; insulated.
 - a. Door Seal: Steam activated; construct from long-life rubber compound.
 - b. Hinged Door with Manual operation; 30 degrees turn door handle actuation required to lock or unlock door.
3. One-piece Insulation Sleeve: Fitted around exterior of sterilizer vessel. Insulation sleeve consists of 1" thick spin glass temperature rated for 500°F continuous and is covered by an asbestos-free, silicone impregnated, oil and water-resistant outer jacket. Outer jacket rated for 500°F.
4. Steam Piping: Construct of copper-brass; includes steam strainer, shutoff valve, and pressure regulator.
5. Pipe, valve, and trap sterilizer to receive electric steam generator supplied steam
6. Piping: All piping and electrical connections to terminate within the confines of the sterilizer.
 - a. Solenoid Valves: Located in manifold with DIN Connectors.
 - b. Manual Shutoff Valves: Pressure rated at 125 psig (862 kPa) for saturated steam. Valve handles to be low-heat conducting.
7. Support sterilizer on height-adjustable carbon steel stand, shop-coated for corrosion protection.
8. Exterior Enclosure: 304L Stainless steel side panels and louvered top panel to enclose sterilizer body and piping.

D. Clearances:

1. Medium Sterilizer: 26" x 37-1/2" x 42" Chamber Size:
 - 38" (965 mm) right side service, from unit centerline.
 - 47" (1194 mm) left side service, from unit centerline.

Installation Height: 42" (1067 mm) H, to centerline of chamber.

2. Small Sterilizer: 20" x 20" x 38" Chamber Size:

29 ½" front panel swing, from face of unit

27" right side service, from unit centerline

30" left side service, from unit centerline

Installation Height: 42 ¾" H, to centerline of chamber

E. Utility Requirements:

1. Medium Sterilizer with integral carbon steel steam generator:

- a. Air Compressor required with either single door or double door
- b. Drain: 2" ODT drain terminal. (Floor drain capacity must handle peak water consumption.)
- c. Generator Drain: 1/2" ODT.
- d. Electrical – Generator and Vacuum Pump:

480 V, 60 Hz, 3-phase

- e. Sterilizer Feed Water:

1" NPT; 20-50 psig (1.38-3.45 bar) dynamic; 70°F (21°C) max.; 171 mg/L max. total hardness (CaCO₃); 500 mg/L max. total dissolved solids; 180 mg/L max. total alkalinity (CaCO₃); 6.5-8.5 pH; 2.5 mg/L max. total silica.

- f. Carbon Steel Steam Generator Feed Water:

1/2" NPT; 20-50 psig (1.38-3.45 bar) dynamic; 140°F (60°C) max.; 130 mg/L max. total hardness (CaCO₃); 250 mg/L max. total dissolved solids; 180 mg/L max. total alkalinity (CaCO₃); 6.5-8.5 pH; 2.5 mg/L max. total silica; 26000 ohms/cm max resistivity.]

2. Small Sterilizer with integral carbon steel steam generator:

- a. Drain: 1 1/2" ODT drain terminal. (Floor drain capacity must handle peak water consumption.)
- b. Generator Drain: 1/2" ODT.
- c. Electrical – Generator and Vacuum Pump:

480 V, 60 Hz, 3-phase

e. Sterilizer Feed Water:

1" NPT; 30-50 psig (1.38-3.45 bar) dynamic; 70°F (21°C) max.; 171 mg/L max. total hardness (CaCO₃); 500 mg/L max. total dissolved solids; 180 mg/L max. total alkalinity (CaCO₃); 6.5-8.5 pH; 2.5 mg/L max. total silica.

f. Carbon Steel Steam Generator Feed Water:

1/2" NPT; 20-50 psig (1.38-3.45 bar) dynamic; 140°F (60°C) max.; 130 mg/L max. total hardness (CaCO₃); 250 mg/L max. total dissolved solids; 180 mg/L max. total alkalinity (CaCO₃); 6.5-8.5 pH; 2.5 mg/L max. total silica; 26000 ohms/cm max resistivity.]

F. Control System

1. Programmable control system that monitors and controls all phases of each sterilizing cycle.
 - a. Control can be programmed for 20 cycles from several types of cycles (Prevac, gravity, liquid, lab waste, USP 660, ATF1 and ATF2).
 - b. Adjustable cycle values and operating features.
 - c. House control system within a sealed compartment to protect components from moisture and heat generated during the sterilization process. Provide a cooling fan with filter in the housing compartment to maintain positive pressure within the compartment, keeping components cool and dust-free.
2. Operator Interface Control Panel:
 - a. Touch-sensitive screen with 18-bit color graphic display
 - b. Display features 640 x 480 resolution color-active matrix
 - c. Display is designed with emphasis on human factors and user recognizable symbols.
3. Thermal Printer: Located on control Panel to provide printed records of all cycle data.

G. Cycle Descriptions: Each sterilizer factory-programmed with the following cycles:

Each sterilizer factory-programmed with the following cycles:

1. **Gravity Cycle:** Provided on gravity, prevacuum, and isothermal sterilizers for the sterilization of heat- and moisture-stable goods at 212-285°F (100-137°C), and decontamination of bagged laboratory wastes. Gravity cycle utilizes the gravity air-displacement principle.

2. **Liquid Cycle:** Provided on gravity, prevacuum, and isothermal sterilizers for the sterilization of liquids and media in vented borosilicate glass or metal containers at 212-254°F (100-123°C). Liquid cycle utilizes the optimal solution cooling feature, during exhaust (cooling) phase, to control the exhaust rate.
3. **Prevacuum Cycle:** Provided only on prevacuum sterilizers for the efficient, high-volume sterilization of porous, heat- and moisture-stable materials at 250-285°F (121-137°C). Prevacuum cycle utilizes a mechanical air-evacuation system.
4. **Continuous Cycle:** This cycle allows for up to 9,999 cycles to be run consecutively without the need of an operator. Cycle parameters can be set, along with the amount of time to lapse in between cycles.
5. **LAB Waste Cycle:** This cycle has been preconfigured with cycle parameters shown to be effective when processing lab waste in autoclavable bags. Through air removal assistance and a controlled exhaust, the internal temperature is increased more effectively and faster, while minimizing boil over of any liquids present. Parameters may need to be adjusted based on specific loads. Bags should not be completely sealed.
6. **Leak Test Cycle:** Provided only on prevacuum sterilizers for verification of door seal and piping system integrity. Cycle parameters are preprogrammed and fixed. The acceptable maximum leak rate is 1 mm Hg/min over a 10-minute period following a fixed stabilization time.
7. **Daily Air Removal Test (DART):** Provided only on prevacuum sterilizers for verification of effective removal of residual air in the chamber and load during testing. Test cycle determines if even and rapid steam penetration into test load has occurred. Cycle parameters are preprogrammed and fixed.
8. **Liquid Air Cool Cycle (Optional)** is designed to efficiently process liquid products in either vented or non-vented (solid) containers that require cooling after the sterilization. During the post-conditioning phase cooling water flows through the jacket with simultaneous air over-pressurization in the chamber preventing the product from boiling and improving exhaust time. See drawing for jacket water utility conditions.

2.2 STERILIZER TYPES AND SIZES

- A. Medium Steam Sterilizer 26" x 37 ½" x 42"
 1. Single door configuration
 2. Freestanding
 3. Hinged Door
- B. Small Steam Sterilizer 20" Prevacuum
 1. Single door configuration
 2. Freestanding

2.3 ACCESSORIES

- A. Medium Sterilizer
 - 1. Loading Rack and Three Shelves: 26 x 37-1/2 x 42"
 - 3. Additional Shelf, module and support: 26 x 37-1/2 x 42"
- B. Small Sterilizer
 - 1. Loading Rack and Two Shelves: 20 x 20 x 38"
 - 3. Additional Shelf, module and support: 20 x 20 x 38"

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS

- A. Install with manufacturer certified personnel.

3.2 EXAMINATION

- A. Inspect and verify that required utilities are available, in proper locations, and ready for use prior to equipment installation. Coordinate with Division 22 and 26 for location, size and type of services required.

3.3 INSTALLATION

- A. Install in strict accordance with manufacturer's printed instructions.
- C. Coordinate with Division 22, 23 and 26 work for installation of building services such as:
 - 1. Lighting of service area.
 - 2. Convenience electrical outlet in service area for maintenance.
 - 3. Isolation valves, vacuum breakers, backflow preventers and fused disconnect switches on utility lines to washer.
- D. Test equipment to assure proper working order according to section 019113 General Commissioning Requirements.

3.4 MANUFACTURER'S FIELD SERVICES

- A. Provide manufacturer's field services to supervise installation.

3.5 CLEANING

- A. Prior to final acceptance, clean soiled surfaces and repair or replace items that become damaged.
- C. Remove packaging debris and other waste resulting from installation of equipment.

3.6 ADJUSTING

- A. Adjust equipment and apparatus installed to ensure performance meets specified requirements.
- B. Adjust and re-test any units not meeting requirements.

3.7 PROTECTION

- A. Protect materials and installed laboratory equipment from damage by work of other trades until final acceptance by the Architect or until beneficial occupancy by the Owner, whichever comes first.

3.8 DEMONSTRATION & COMMISSIONING

- A. Follow Section 019113 for information on commissioning as well as Operation & Maintenance (O&M) Manuals.
- B. Demonstrate operation, function and maintenance of equipment in presence of Owner.
- C. Provide four hours of instruction on operation and maintenance for each type of equipment to Owner's operating personnel.

END OF SECTION 11 62 20

**SECTION 122400
WINDOW SHADES**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. WCMA A100.1 - Safety of Window Covering Products 2018.

1.02 SUBMITTALS

- A. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.
- B. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.
- C. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.04 MOCK-UP

- A. Mock-Up: Provide full size mock-up of window shade system complete with selected shade fabric including example of seams and batten pockets when applicable.
 - 1. Full-sized mock-up may become part of the final installation.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.06 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.07 WARRANTY

- A. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
 - 1. Shade Hardware: One year.
 - 2. Electric Motors: One year.
 - 3. Electronic Control Equipment: One year.
 - 4. Fabric: One year.
 - 5. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Interior Manually Operated Roller Shades:
 - 1. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.
 - 2. Hunter Douglas Architectural; RB500 Manual Roller Shades: www.hunterdouglasarchitectural.com/#sle.
 - 3. Levolor; [_____]: www.levolor.com/commercial/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.

2.02 ROLLER SHADES

- A. General:
 - 1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
 - 2. Provide shade system that operates smoothly when shades are raised or lowered.

- B. Interior Roller Shades Type RS-1 - Basis of Design: Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.
1. Description: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and other components necessary for complete installation.
 - a. Mounting: Window jamb mounted - outside, on face of jambs.
 2. Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
 - a. Hardware Type: Universal brackets.
 3. Roller Tubes: As required for type of shade operation; designed for removal without removing mounting hardware.
 - a. Material: Extruded aluminum or steel, with wall thickness and material selected by manufacturer.
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 4. Hembars: Designed to maintain bottom of shade straight and flat, selected from manufacturer's standard options.
 5. Manual Operation:
 - a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
 - b. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 pounds minimum breaking strength. Provide upper and lower limit stops.
 - c. Chain Retainer:
 - 1) Chain tensioning device complying with WCMA A100.1.
 6. Accessories:
 - a. Exposed Headbox: Extruded aluminum, size as required to conceal shade mounting; clear anodized finish.
 - 1) Color: Black.
 - b. Fasteners: Noncorrosive, and as recommended by shade manufacturer.
- C. Interior Roller Shades Type RS-2 - Basis of Design: Draper, Inc; Manual LightBloc FlexShade: www.draperinc.com/#sle.
1. Description: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and other components necessary for complete installation.
 - a. Mounting: Window jamb mounted - outside, on face of jambs.
 2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
 3. Roller Tubes: As required for type of shade operation; designed for removal without removing mounting hardware.
 - a. Material: Extruded aluminum or steel, with wall thickness and material selected by manufacturer.
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 4. Hembars: Designed to maintain bottom of shade straight and flat, selected from manufacturer's standard options.
 5. Manual Operation:
 - a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
 - b. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 pounds minimum breaking strength. Provide upper and lower limit stops.
 - c. Chain Retainer:
 - 1) Chain tensioning device complying with WCMA A100.1.
 6. Accessories:
 - a. Light Gap Reduction Channels: Provide extruded aluminum side, center, and sill channels as required for room-darkening shade applications.

- b. Exposed Headbox: Extruded aluminum, size as required to conceal shade mounting; clear anodized finish.
 - 1) Color: Black.

2.03 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
 - 1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
 - 2. Horizontal Dimensions - Outside Mounting: Extend shades 1 inches beyond jambs on each side.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
- B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

3.05 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

3.06 PROTECTION

- A. Protect installed products from subsequent construction operations.

END OF SECTION 122400

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SECTION 12 35 53.13 - METAL LABORATORY CASEWORK

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. Metal laboratory casework.
2. Utility-space framing at backs of base cabinets.
3. Filler and closure panels.
4. Laboratory casework system that includes support and utility-space framing, filler and closure panels, ceiling panels, and undercabinet lighting.
5. Laboratory countertops.
6. Tables.
7. Shelves.
8. Laboratory sinks.
9. Laboratory accessories.
10. Water, laboratory gas, and electrical service fittings.

B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring laboratory casework.
2. Section 096513 "Resilient Base and Accessories" for resilient base applied to laboratory casework.
3. Section 115313 "Laboratory Fume Hoods" for fume hoods, including base cabinets and countertops under fume hoods.

1.3 PREINSTALLATION MEETINGS

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

1.4 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements for support of laboratory casework.
- B. Coordinate installation of laboratory casework with installation of laboratory equipment.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For laboratory casework.
 - 1. Include plans, elevations, sections, and attachments to other work including blocking and reinforcements required for installation.
 - 2. Indicate types and sizes of casework.
 - 3. Indicate manufacturer's catalog numbers for casework.
 - 4. Show fabrication details, including types and locations of hardware.
 - 5. Indicate locations and types of service fittings.
 - 6. Include details of utility spaces showing supports for conduits and piping.
 - 7. Include details of support framing system.
 - 8. Include details of exposed conduits, if required, for service fittings.
 - 9. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and laboratory equipment.
 - 10. Include coordinated dimensions for laboratory equipment specified in other Sections.
- C. Samples: For casework finishes and materials requiring color selection.
- D. Samples for Initial Selection: For casework finishes and materials requiring color selection.
- E. Samples for Verification: For each type of casework, exposed-hardware, and countertop-material finish, in manufacturer's standard sizes.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Test Reports:
 - 1. Casework: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory casework with requirements of specified product for casework.
 - 2. Countertop Surface Material: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory countertop surface material with requirements specified for chemical and physical resistance.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish complete touchup kit for each type and color of casework finish provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.
- B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Cabinet Mounting Clips and Related Hardware: Quantity equal to 5 percent of amount installed, but no fewer than 20 of each type.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that produces casework of types indicated for this Project that has been tested for compliance with SEFA 8 M-2010.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, utility roughing-in and wet-work are complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Established Dimensions: Where laboratory casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.
- C. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Bedco Labs. 2305 Francis Hughes Avenue
- B. Kewaunee Scientific Corporation. 2700 Front Street. Statesville, NC 28667
- C. Mott Manufacturing Ltd. Corporate Headquarters 452 Hardy Road, Brantford ON
- D. Source Limitations: Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.
- E. Product Designations: Drawings indicate sizes and configurations of laboratory casework by referencing designated manufacturer's catalog numbers. Other manufacturers' laboratory casework of similar sizes and similar door and drawer configurations and complying with Specifications may be considered. See Section 016000 "Product Requirements."
- F. The selected manufacturer must warrant for a period of one-year starting (date of acceptance or occupancy, whichever comes first) that all products sold under the contract referenced above shall be free from defects in material and workmanship. Purchaser shall notify the manufacturer's representative immediately of any defective product. The manufacturer shall have a reasonable opportunity to inspect the goods. The purchaser shall return no product until receipt by purchaser of written shipping instructions from the manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. System Structural Performance: Laboratory casework and support framing system shall withstand the effects of the following gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:
1. Support Framing System: 500 lb/ft.
 2. Suspended Base Cabinets (Internal Load): 250 lb/ft.
 3. Work Surfaces (Including Tops of Suspended Base Cabinets): 250 lb/ft.
 4. Wall Cabinets (Upper Cabinets): 250 lb/ft.
 5. Shelves: 90 lb/sq. ft.

2.3 CASEWORK, GENERAL

- A. Casework Product Standard: Comply with SEFA 8 M-2010, "Laboratory Grade Metal Casework."
- B. Flush overlay cabinet style.
- C. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements in NFPA 30, O.S.H.A. Standard 1910-106(d)(3), and UL 1275/1275C.
- D. 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.

2.4 METAL CASEWORK MATERIALS

- A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet per ASTM A366-85, class 1.
- B. Complying with ASTM A1008/A1008M; matte finish; suitable for exposed applications.
- C. Nominal Metal Thickness:
1. Sides, Ends, Fixed Backs, Bottoms, Tops, Soffits, and Items Not Otherwise Indicated: 0.048 inch.
 2. Back Panels, Doors, Drawer Fronts and Bodies, and Shelves: 0.036 inch except 0.048 inch for back panels and doors of flammable liquid storage cabinets and for unreinforced shelves more than 36 inches long.
 3. Intermediate Horizontal Rails, Table Aprons and Cross Rails, Center Posts, and Top Gussets: 0.060 inch.
 4. Drawer Runners, Sink Supports, and Hinge Reinforcements: 0.075 inch.
 5. Leveling and Corner Gussets: 0.105 inch.

2.5 AUXILIARY CABINET MATERIALS

- A. Acid Storage-Cabinet Lining: 1/4-inch thick polypropylene lining material.
- B. Laminated Glass for Glazed Doors: Clear laminated annealed glass complying with ASTM C1172, Kind LA, Condition A, Type I, Class I, Quality-Q3; with two plies not less than 3.0 mm thick and with clear, polyvinyl butyral interlayer.

2.6 CABINET HARDWARE

- A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
- B. Hinges: Type 304 Stainless steel, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two for doors 36 inches high or less and three for doors more than 36 inches high.
- C. Hinged-Door and Drawer Pulls: stainless steel, back-mounted pulls. Provide two pulls for drawers more than 30 inches wide.
 - 1. Design: As selected from manufacturer's full range
 - 2. Overall Size: As selected from manufacturer's full range
- D. Sliding-Door Pulls: Stainless steel recessed flush pulls.
 - 1. Design and Size: As selected from manufacturer's full range
- E. Recessed Pulls: Aluminum. Provide two pulls for drawers more than 24 inches (600 mm) wide.
- F. Channel Pulls: Full-width, recessed channel pulls; integrally formed from front pan of doors and drawer fronts.
- G. Door Catches: Dual, self-aligning, permanent magnet catches. Provide two catches on doors more than 48 inches high.
- H. Drawer Slides: Side mounted, epoxy-coated steel, 150 pound, soft close, self-closing; designed to prevent rebound when drawers are closed; complying with BHMA A156.9, Type B05091.
 - 1. Provide Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
 - 2. Standard Duty (Grade 1): Full-extension type, with polymer rollers.
- I. Sliding-Door Hardware Sets: Laboratory casework manufacturer's standard, to suit type and size of sliding-door units.

2.7 COUNTERTOP, TABLETOP, SHELF, and SINK MATERIALS

- A. Epoxy: Factory-molded, modified epoxy-resin formulation with smooth, nonspecular finish.
 - 1. Durcon
American Epoxy
Prime Industries.
 - 2. Physical Properties:
 - a. Flexural Strength: Not less than 10,000 psi (70 MPa).
 - b. Modulus of Elasticity: Not less than 2,000,000 psi (1400 MPa).
 - c. Hardness (Rockwell M): Not less than 100.
 - d. Water Absorption (24 Hours): Not more than 0.02 percent.

- e. Heat Distortion Point: Not less than 260 deg F (127 deg C).
3. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:
- a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.
 - b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).
4. Color: As selected by Architect from epoxy manufacturer's full range.

2.8 METAL CABINETS AND TABLES

- A. Fabrication: Assemble and finish units at point of manufacture. Use precision dies for interchangeability of like-size drawers, doors, and similar parts. Perform assembly on precision jigs to provide units that are square. Reinforce units with angles, gussets, and channels. Except where otherwise specified, integrally frame and weld cabinet bodies to form dirt- and vermin-resistant enclosures. Where applicable, reinforce base cabinets for sink support. Maintain uniform clearance around door and drawer fronts of 3/32 inch.
- B. Flush Doors: Outer and inner pans that nest into box formation, with full-height channel reinforcements at center of door. Fill doors with noncombustible, sound-deadening material.
- C. Glazed Doors: Hollow-metal stiles and rails of similar construction as flush doors, with glass held in resilient channels or gasket material.
- D. Hinged Doors: Mortise for hinges and reinforce with angles welded inside inner pans at hinge edge.
- E. Drawers: Fronts made from outer and inner pans that nest into box formation, without raw metal edges at top. Sides, back, and bottom fabricated in one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal. Provide drawers with rubber bumpers, polymer roller slides, and positive stops to prevent metal-to-metal contact or accidental removal.
- F. Adjustable Shelves: Front, back, and ends formed down, with edges returned horizontally at front and back to form reinforcing channels. Lip in front to prevent items from falling during possible seismic events.
- G. Toe Space: Fully enclosed, 4 inches high by 3 inches deep, with no open gaps or pockets.
- H. Tables: Welded tubing legs, not less than 2 inches square with channel stretchers as needed to comply with product standard. Weld or bolt stretchers to legs and cross-stretchers, and bolt legs to table aprons. Provide leveling device welded to bottom of each leg.
 - 1. Leg Shoes: Black rubber, open-bottom, slip-on type.
 - 2. Provide casters: Where indicated on drawings, provide 4 by 1 ¼ inch polyurethane wheels with dual locking mechanism for locking both swivel and wheel. Provide caster with 250 pound load capacity per caster. Provide levelers loose for future use.

- I. Utilities: Provide space, cutouts, and holes for pipes, conduits, and fittings in cabinet bodies to accommodate utility services and their support-strut assemblies.
 - 1. Provide base cabinets with removable backs for access to utility space.
- J. Utility-Space Framing: Steel framing units consisting of two steel slotted channels complying with MFMA-4, not less than 1-5/8 inches square by 0.105-inch nominal thickness, that are connected at top and bottom by U-shaped brackets made from 1-1/4-by-1/4-inch steel flat bars. Framing units may be made by welding channel material into rectangular frames instead of using U-shaped brackets.
- K. Filler and Closure Panels: Provide where indicated and as needed to close spaces between casework and walls, ceilings, and equipment. Fabricate from same material and with same finish as casework and with hemmed or flanged edges unless otherwise indicated.
 - 1. Provide knee-space panels (modesty panels) at spaces between base cabinets, where indicated on drawings. Fabricate from back-to-back panels or of hollow construction to eliminate exposed hemmed or flanged edges.
 - 2. Provide utility-space closure panels at spaces between base cabinets where utility space would otherwise be exposed, including spaces below countertops.
 - 3. Provide closure panels at ends of utility spaces where utility space would otherwise be exposed.

2.9 LABORATORY CASEWORK SYSTEM

- A. Provide casework manufacturer's standard integrated system that includes support framing, suspended modular cabinets, filler and closure panels, undercabinet task-lighting fixtures, countertops, and fittings needed to assemble system. System includes hardware and fasteners for securing support framing to permanent construction.
 - 1. Cabinets can be removed and reinstalled without use of special tools for relocation within system.
 - 2. Base cabinets can be removed without providing temporary support for, or removing, countertops.
 - 3. Sinks are supported independent of base cabinets.
 - 4. Support framing has provision for fastening pipe supports at utility space in not more than 1-inch increments.
 - 5. System includes filler and closure panels to close spaces between support framing, cabinets, shelves, countertops, floors, and walls unless otherwise indicated. Fabricate panels from same material and with same finish as metal cabinets and with hemmed or flanged edges.
- B. Support Framing: Casework manufacturer's standard system consisting of vertical supports and connecting braces and rails as follows:
 - 1. Cabinets, shelves, and countertops are supported from vertical supports except where floor-supported base cabinets are indicated. Vertical positioning of supported cabinets, shelves, and countertops can be varied in 1-inch (25-mm) increments through full height of supports.
 - 2. Vertical supports rest on adjustable leveling bases and are secured to floor with metal clips fastened to floor.
 - 3. Vertical supports are installed with braces and rails, connecting them to each other and to permanent building walls to create a stable, rigid structure with framed utility spaces where indicated.

C. Undercabinet Task-Light Luminaires:

1. Lamp Type: LED with switch and heavy-duty cord and plug.
2. Finish: Baked enamel.
3. Diffusers: Virgin acrylic with high resistance to yellowing and other changes from aging, heat, and UV radiation.

D. Countertops: Provide in modular lengths indicated, without seams.

2.10 MODULAR CASEWORK SYSTEM

A. Provide casework manufacturer's standard modular system where the structural module is the primary support for the adjustable worksurface frames, shelving, and suspended casework. It can also be used as a chase and support structure for electrical and plumbing services.

1. Construction: All-welded frame construction of 16 gage steel tubing creating a full perimeter frame capable of supporting an evenly distributed 1,000 pound load.
2. Legs: 16 gauge steel tubing with stainless steel interior sliding tube, threaded at 1 inch increments for dual bold height adjustment. Interior sliding tube shall be enclosed at one end with a threaded insert plate. Threaded insert plate for interchangeable casters and levelers shall be welded to the bottom of the legs.
3. Provide adjustments that allows for 30" to 37" table heights while on casters or levelers without affecting table height adjustment range.
4. Provide casters: 4 by 1 ¼ inch polyurethan wheels with dual locking mechanism for locking both swivel and wheel. Provide caster with 250 pound load capacity per caster. Provide levelers loose for future use.
5. Intermediate hanging rail: 16 gage steel for suspended shelving installation.
6. Lower cross members: 16 gage steel tubing.

B. Power data raceway: Provide integrated power data raceway prewired to accept NEMA twist lock at ceiling utility panel above.

C. Undercabinet Task-Light Luminaires:

1. Lamp Type: LED with switch and heavy-duty cord and plug.
2. Finish: Baked enamel.
3. Diffusers: Virgin acrylic with high resistance to yellowing and other changes from aging, heat, and UV radiation.

D. Countertops: Provide epoxy tops in modular lengths indicated, without seams.

2.11 METAL CABINET FINISH

A. General: Prepare, treat, and finish welded assemblies after assembling. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling. Prepare, treat, and finish concealed surfaces same as exposed surfaces.

B. Preparation: After assembly, clean surfaces of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to organic coating to be applied over it.

C. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply laboratory casework manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime coat

and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8 M-2010. Acceptance level for chemical spot test shall be no more than for Level 3 conditions.
2. Colors for Metal Laboratory Casework Finish: As selected by Architect from manufacturer's full range.

3. Performance Test Results (Chemical Spot Tests):

a. Testing Procedure:

Chemical spot tests for non-volatile chemicals shall be made by applying 5 drops of each reagent to the surface to be tested and covering with a 1-1/4" dia. watch glass, convex side down to confine the reagent. Spot tests of volatile chemicals shall be tested by placing a cotton ball saturated with reagent on the surface to be tested and covering with an inverted 2-ounce wide mouth bottle to retard evaporation. All spot tests shall be conducted in such a manner that the test surface is kept wet throughout the entire test period, and at a temperature of 77° ±3° F. For both methods, leave the reagents on the panel for a period of one hour. At the end of the test period, the reagents shall be flushed from the surface with water, and the surface scrubbed with a soft bristle brush under running water, rinsed and dried. Volatile solvent test areas shall be cleaned with a cotton swab soaked in the solvent used on the test area. Immediately prior to evaluation, 16 to 24 hours after the reagents are removed, the test surface shall be scrubbed with a damp paper towel and dried with paper towels.

a. Test Evaluation:

Evaluation shall be based on the following rating system.

Level 0	–	No detectable change.
Level 1	–	Slight change in color or gloss.
Level 2	–	Slight surface etching or severe staining.
Level 3	–	Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.

After testing, panel shall show no more than three (3) Level 3 conditions.

b. Test Reagents

Test No.	Chemical Reagent	Test Method
1.	Acetate, Amyl	Cotton ball & bottle
2.	Acetate, Ethyl	Cotton ball & bottle
3.	Acetic Acid, 98%	Watch glass
4.	Acetone	Cotton ball & bottle
5.	Acid Dichromate, 5%	Watch glass
6.	Alcohol, Butyl	Cotton ball & bottle
7.	Alcohol, Ethyl	Cotton ball & bottle
8.	Alcohol, Methyl	Cotton ball & bottle
9.	Ammonium Hydroxide, 28%	Watch glass
10.	Benzene	Cotton ball & bottle
11.	Carbon Tetrachloride	Cotton ball & bottle
12.	Chloroform	Cotton ball & bottle
13.	Chromic Acid, 60%	Watch glass
14.	Cresol	Cotton ball & bottle
15.	Dichlor Acetic Acid	Cotton ball & bottle
16.	Dimethylformamide	Cotton ball & bottle

17.	Dioxane	Cotton ball & bottle
18.	Ethyl Ether	Cotton ball & bottle
19.	Formaldehyde, 37%	Cotton ball & bottle
20.	Formic Acid, 90%	Watch glass
21.	Furfural	Cotton ball & bottle
22.	Gasoline	Cotton ball & bottle
23.	Hydrochloric Acid, 37%	Watch glass
24.	Hydrofluoric Acid, 48%	Watch glass
25.	Hydrogen Peroxide, 3%	Watch glass
26.	Iodine, Tincture of	Watch glass
27.	Methyl Ethyl Ketone	Cotton ball & bottle
28.	Methylene Chloride	Cotton ball & bottle
29.	Mono Chlorobenzene	Cotton ball & bottle
30.	Naphthalene	Cotton ball & bottle
31.	Nitric Acid, 20%	Watch glass
32.	Nitric Acid, 30%	Watch glass
33.	Nitric Acid, 70%	Watch glass
34.	Phenol, 90%	Cotton ball & bottle
35.	Phosphoric Acid, 85%	Watch glass
36.	Silver Nitrate, Saturated	Watch glass
37.	Sodium Hydroxide, 10%	Watch glass
38.	Sodium Hydroxide, 20%	Watch glass
39.	Sodium Hydroxide, 40%	Watch glass
40.	Sodium Hydroxide, Flake	Watch glass
41.	Sodium Sulfide, Saturated	Watch glass
42.	Sulfuric Acid, 33%	Watch glass
43.	Sulfuric Acid, 77%	Watch glass
44.	Sulfuric Acid, 96%	Watch glass
45.	Sulfuric Acid, 77% and Nitric Acid, 70%, equal parts	Watch glass
46.	Toluene	Cotton ball & bottle
47.	Trichloroethylene	Cotton ball & bottle
48.	Xylene	Cotton ball & bottle
49.	Zinc Chloride, Saturated	Watch glass

* Where concentrations are indicated, percentages are by weight.

1. Performance Test Results (Heat Resistance):
Hot water (190° F - 205° F) shall be allowed to trickle (with a steady stream at a rate not less than 6 ounces per minute) on the finished surface, which shall be set at an angle of 45° from horizontal, for a period of five minutes. After cooling and wiping dry, the finish shall show no visible effect from the hot water treatment.
2. Performance Test Results (Impact Resistance):
A one-pound ball (approximately 2" diameter) shall be dropped from a distance of 12 inches onto the finished surface of steel panel supported underneath by a solid surface. There shall be no evidence of cracks or checks in the finish due to impact upon close eye-ball examination.
3. Performance Test Results (Bending Test):
An 18 gauge steel strip, finished as specified, when bent 180° over a 1/2" diameter mandrel, shall show no peeling or flaking off of the finish.
4. Performance Test Results (Adhesion):
Ninety or more squares of the test sample shall remain coated after the scratch adhesion test. Two sets of eleven parallel lines 1/16" apart shall be cut with a razor blade to intersect at right angle thus forming a grid of 100 squares. The cuts shall be made just

deep enough to go through the coating, but not into the substrate. They shall then be brushed lightly with a soft brush. Examine under 100 foot-candles of illumination. Note: This test is based on ASTM D2197-68, "Standard Method of Test for Adhesion of Organic Coatings".

5. Performance Test Results (Hardness):

The test sample shall have a hardness of 4-H using the pencil hardness test. Pencils, regardless of their brand are valued in this way: 8-H is the hardest, and next in order of diminishing hardness are 7-H, 6-H, 5-H, 4-H, 3-H, 2-H, F, HB, B (soft), 2-B, 3-B, 4-B, 5-B (which is the softest).

The pencils shall be sharpened on emery paper to a wide sharp edge. Pencils of increasing hardness shall be pushed across the paint film in a chisel-like manner until one is found that will cut or scratch the film. The pencil used before that one-that is, the hardest pencil that will not rupture the film-is then used to express or designate the hardness.

2.12 COUNTERTOPS, TABLETOPS, SHELVES, TROUGHS, SINKS, CEILING UTILITY PANELS

- A. Countertops, General: Provide units with smooth surfaces in uniform plane, free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1 inch.
- B. Sinks, General: Provide sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume, as approved by Architect.
 - 1. Outlets: Provide with strainers and tailpieces, NPS 1-1/2 (DN 40), unless otherwise indicated.
 - 2. Overflows: For each sink except cup sinks, provide overflow of standard beehive or open-top design with separate strainer. Height 2 inches less than sink depth. Provide in same material as strainer.
- C. Epoxy Countertops, Tabletops, and Sinks:
 - 1. Countertop Fabrication: Fabricate with factory cutouts for sinks, holes for service fittings and accessories, and butt joints assembled with epoxy adhesive and concealed metal splines.
 - a. Marine-Edge Configuration: 1-inch minimum thickness, with integral or applied raised edge.
 - 1) Edges and Corners: Beveled.
 - 2) Backsplash: Applied.
 - b. Construction: Uniform throughout full thickness.
 - c. Color: As selected by Architect from manufacturer's full range of colors.
 - 2. Tabletop Fabrication:
 - a. Flat Configuration: 1 inch thick with continuous drip groove on underside at perimeter.
 - 1) Edges and Corners: Beveled.

- b. Tabletop Construction: Uniform throughout full thickness.
 3. Sink Fabrication: Molded in one piece with smooth surfaces, coved corners, and bottom sloped to outlet; 1/2-inch minimum thickness.
 - a. Provide with polypropylene strainers and tailpieces.
 - b. Provide drop in sinks in epoxy countertops, bonded to countertops with invisible joint line.
 - c. Marine-Edge Configuration: 1-inch minimum thickness, with raised edge and integral coved backsplash.
 - 1) Edges and Corners: Beveled.
 4. Provide 1/4" dished surface 3'-6" wide by 2'-2" deep unless shown otherwise on drawings.
 5. Factory punch holes for service fittings.
 6. Reinforce underside of countertop with channels, or use thicker metal sheet where necessary to ensure rigidity without deflection.
 7. Weld shop-made joints.
 8. Where field-made joints are required, provide hairline butt joints mechanically bolted through continuous channels welded to underside at edges of joined ends. Keep field jointing to a minimum.
 9. After fabricating and welding, grind surfaces smooth and polish to produce uniform, directionally textured finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.
- D. Stainless Steel Sinks: Made from stainless steel sheet, not less than 0.050-inch nominal thickness. Fabricate with corners rounded and coved to at least 5/8-inch radius. Slope sink bottoms to outlet. Provide continuous butt-welded joints.
1. After fabricating and welding, grind surfaces smooth and polish to produce uniform finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.
 2. Factory punch holes for fittings.
 3. Provide with stainless steel strainers and tailpieces.
 4. Apply 1/8-inch thick coating of heat-resistant, sound-deadening mastic to undersink surfaces.
- E. Troughs: Provide in material indicated and pitch to drains not less than 1/8 inch/foot. Except where troughs empty into sinks, provide NPS 1-1/2 (DN 40) outlets with strainers and tailpieces.
1. Epoxy Troughs: Molded in one piece with smooth surfaces and coved corners; 5/8-inch minimum thickness. Provide polypropylene strainers and tailpieces.
- F. Ceiling Utility Panels: Provide powder coated steel panels to match casework finish as indicated on the drawings.
1. Drop in Panels: Size panels to fit in standard drop in T grid system. Provide color coded quick connects for each gas utility as indicated on drawings. Provide corresponding quick connect hose reel. Provide pre-punched locations for a total of 12 spaces for plumbing utilities. Provide two punched openings for standard data receptacles. Provide punched openings for electrical receptacles as indicated on drawings. Allow adequate space

between each opening for electrical components required to make electrical connection above receptacles.

2. Free standing Panels: Match dimensions and requirements of drop in panels. Turn up edges on side of panel 6" minimum. Provide uni-strut bracing as required to suspend ceiling panels from structure above.

2.13 LABORATORY ACCESSORIES

- A. Resin Pegboards: Epoxy pegboards with removable polypropylene pegs and stainless steel drip troughs with drain outlet.
- B. Snorkel Exhaust: All laboratory extractors to be powder coated aluminum and have a full swivel that allows 360 degrees of rotation with the need to add special sleeve couplings. Total length of moveable arms to be 60" minimum. Joints to have reinforced ends and ball bearings to moderate the friction and allow the arm to be moved up and down while maintaining stability and function. Metal chemistry hood to be powder coated aluminum. All mounting brackets, extensions, and reductions to be provided by casework vendor. All snorkels to be constant volume and allow for 80 fpm flow without any shut off valves that would allow end users to adjust snorkel flow rate.

2.14 WATER AND LABORATORY GAS SERVICE FITTINGS

- A. Manufacturer: Watersaver
- B. Service Fittings: Provide units that comply with SEFA 7, "Recommended Practices for Fixtures." Provide fittings complete with washers, locknuts, nipples, and other installation accessories. Include wall and deck flanges, escutcheons, handle extension rods, and similar items.
- C. Materials: Fabricated from cast or forged red brass unless otherwise indicated.
 1. Reagent-Grade Water Service Fittings: Polypropylene, PVC, or PVDF for parts in contact with water.
- D. Finish: Chromium plated
 1. Provide chemical-resistant powder coating in laboratory casework manufacturer's standard metallic brown, aluminum, white, or other color as approved by Architect.
- E. Water Valves and Faucets: Provide units complying with ASME A112.18.1, with renewable seats, designed for working pressure up to 80 psig (550 kPa).
 1. Vacuum Breakers: Provide ASSE 1035 vacuum breakers on water fittings with serrated outlets.
 2. Aerators: Provide aerators on water fittings that do not have serrated outlets.
 3. Self-Closing Valves: Provide self-closing valves where indicated.
- F. Ball Valves: Chrome-plated ball and PTFE seals. Handle requires no more than 5 lbf (22 N) to operate. Provide units designed for working pressure up to 75 psig (520 kPa), with serrated outlets.
 1. Locking Safety Handles: Where ball valves are indicated for fuel-gas use, provide handles that must be pulled up before being turned on.

- G. Ground-Key Cocks: Tapered core and handle of one-piece forged brass, ground and lapped, and held in place under constant spring pressure. Provide units designed for working pressure up to 40 psig (280 kPa), with serrated outlets.
- H. Needle Valves: Provide units with renewable, self-centering, floating cones and renewable seats of stainless steel or Monel metal, with removable serrated outlets.
 - 1. Provide units designed for working pressure up to 100 psig.
- I. Hand of Fittings: Furnish right-hand fittings unless fitting designation is followed by "L."
- J. Remote-Control Valves: Provide needle valves, straight-through or angle type as indicated for fume hoods and where indicated.
- K. Handles: Provide three- or four-arm, forged-brass handles for valves unless otherwise indicated.
 - 1. Provide lever-type handles for ground-key cocks. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
 - 2. Provide lever-type handles for ball valves unless otherwise indicated. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
 - 3. Provide heat-resistant plastic handles for steam valves.
 - 4. Provide knurled, molded-plastic handles for needle valves.
- L. Service-Outlet Identification: Provide color-coded plastic discs with embossed identification, secured to each service-fitting handle to be tamper resistant. Comply with SEFA 7 for colors and embossed identification.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION OF CABINETS

- A. Comply with installation requirements in SEFA 2. Install level, plumb, and true in line; shim as required using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:
 - 1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet (1.5 mm in 3 m).
 - 2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet (3 mm in 3 m).
 - 3. Variation of Faces of Casework from a True Plane: 1/8 inch in 10 feet (3 mm in 3 m).
 - 4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch (0.8 mm).
 - 5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch (1.5 mm).
- B. Utility-Space Framing: Secure to floor with two fasteners at each frame. Fasten to partition framing, wood blocking, or metal reinforcements in partitions and to base cabinets.

- C. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions, with fasteners spaced not more than 16 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
 - 1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches o.c. and at sides of cabinets with not less than two fasteners per side.
- D. Wall Cabinets: Fasten to hanging strips, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 16 inches o.c.
- E. Install hardware uniformly and precisely.
- F. Adjust operating hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF COUNTERTOPS

- A. Comply with installation requirements in SEFA 2. Abut top and edge surfaces true in plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints where indicated on Shop Drawings.
- B. Field Jointing: Where possible, make in same manner as shop-made joints, using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Shop prepare edges for field-made joints.
- C. Fastening:
 - 1. Secure countertops, except for epoxy countertops, to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
 - 2. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 inches (1200 mm) o.c.
 - 3. Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch (3 mm) and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.
- D. Provide holes and cutouts required for service fittings.
- E. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.
- F. Dress joints smooth, remove surface scratches, and clean entire surface.

3.4 INSTALLATION OF SINKS

- A. Comply with installation requirements in SEFA 2.
- B. Drop-in Installation of Epoxy Sinks: Rout groove in countertop to receive sink rim if not shop prepared. Set sink in adhesive and fill remainder of groove with sealant or adhesive. Use procedures and products recommended by sink and countertop manufacturers. Remove excess adhesive and sealant while still wet and finish joint for neat appearance.

- C. Semiflush Installation of Stainless Steel Sinks: Before setting, apply sink and countertop manufacturers' recommended sealant under rim lip and along top. Remove excess sealant while still wet and finish joint for neat appearance.

3.5 INSTALLATION OF LABORATORY ACCESSORIES

- A. Install accessories in accordance with Shop Drawings, installation requirements in SEFA 2, and manufacturer's written instructions.
- B. Securely fasten adjustable shelving supports, stainless steel shelves, and pegboards to partition framing, or reinforcements in partitions.
- C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.
- D. Securely fasten pegboards to partition framing, or reinforcements in partitions.

3.6 INSTALLATION OF SERVICE FITTINGS

- A. Comply with requirements in other Sections for installing water and laboratory gas service fittings and electrical devices.
- B. Install fittings in accordance with Shop Drawings, installation requirements in SEFA 2, and manufacturer's written instructions. Set bases and flanges of sink- and countertop-mounted fittings in sealant recommended by manufacturer of sink or countertop material. Securely anchor fittings to laboratory casework unless otherwise indicated.

3.7 CLEANING AND PROTECTING

- A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- B. Protect countertop surfaces during construction with 6-mil (0.15-mm) plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of 48 inches (1200 mm) o.c.

3.8 SERVICE-FITTING SCHEDULE

- A. Laboratory service fittings as indicated on drawings.

END OF SECTION 12 35 53.13

**SECTION 123600
COUNTERTOPS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Countertops for architectural cabinet work.

1.02 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 4.0 2021.
- D. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material 2013.
- E. MIA (DSDM) - Dimensional Stone Design Manual, Version VIII 2016.
- F. NEMA LD 3 - High-Pressure Decorative Laminates 2005.
- G. PS 1 - Structural Plywood 2009 (Revised 2019).

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- B. Quality Certification:
 - 1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 2. Provide designated labels on shop drawings as required by certification program.
 - 3. Provide designated labels on installed products as required by certification program.
 - 4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

- A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Natural Quartz over continuous substrate.
 - 1. Flat Sheet Thickness: 1-1/8" inch, minimum.
 - 2. Natural Quartz Slabs: Complying with ISFA 3-01 and NEMA LD 3; [] resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with the MIA Dimension Stone Design Manual.
 - b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - c. Finish on Exposed Surfaces: Polished.
 - d. Color and Pattern: As indicated on drawings.
 - 3. Other Components Thickness: 3/4 inch, minimum.
 - 4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; mitered edge.
 - 5. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

2.02 MATERIALS

- A. Wood-Based Components:
 - 1. Wood fabricated from old growth timber is not permitted.
 - 2. Provide sustainably harvested wood, certified or labeled as specified in Section 016000 - Product Requirements.
 - 3. Provide wood harvested within a 500 mile radius of the project site.
- B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.
- C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.03 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches, unless otherwise indicated.
- C. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
- D. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

PART 3 EXECUTION

3.01 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.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

- A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 123600

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**SECTION 133501
CHEMICAL STORAGE BUILDING**

ADD ALTERNATE NO. 4

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Factory fabricated chemical storage building..

1.02 RELATED REQUIREMENTS

- A. Section 033000: Cast In Place Concrete.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate building size, height, anchoring details, interior elevations, building section, electrical connections, ventilation, and fire protection..
- C. Certificate: Certify that products of this section meet or exceed specified requirements.
- D. Delegated Design Documents: Drawings and calculations professional engineer registered in the State of Florida.
- E. Manufacturer's qualification statement.
- F. Testing agency's qualification statement.
- G. Specimen warranty.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design under direct supervision of Professional Engineer experienced in design of this type of work and licensed in Florida.
 - 1. Provide all necessary local jurisdiction approvals for manufactured / fabricated building as required by State of Florida statutes and codes.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least 10 years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- D. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions, erection drawings, and shop drawings.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for complete building assembly. Complete forms in Owner's name and register with manufacturer.
- C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 COMPONENTS

- A. Description:
 - 1. Exterior Dimensions: 16'-0" long x 5'-6" deep x 9'-5" high.
 - 2. Interior Dimensions: 14'-2" long x 4'-2" deep x 7'-6" high.
 - 3. Building Weight: 10,050 lbs
 - 4. Floor Load: 205 psf
 - 5. Wind Load: Comply with Florida Building Code.
 - 6. Sump Capacity: 218 gallons.
- B. Design Criteria:

1. WALL STRUCTURAL FRAMEWORK: Two hour bi-directional fire rated, weatherproof construction that meets or exceeds UL 263 and ASTM E-119. Fabricated from 14ga galvanized steel proprietary studs placed 24-inch on center. Building perimeter shall have 6"x4"x1/8" steel tubing minimum below and above wall studs. The corner studs and door frame opening studs shall be minimum 4"x3"x1/8". Framework connected by welding. Construction consists of multiple layers of UL Listed gypsum wallboard encased between Galvanneal steel sheets on interior and exterior faces for maximum durability. Gypsum wall board layers are offset with overlapping joints. Mineral wool installed in the wall cavity with a R-12 minimum rating..
2. ROOF SYSTEM: One (1) hour Per IBC Section 722, fire rated Class A flame spread rating. Wind uplift exceeds UL I-60 and is constructed of 1 hour fire rated, weatherproof construction. Exterior roof sheets are continuously welded to roof supports at each seam. Roof Structural System is fabricated from 4"X2"X1/8" structural tubing on 24" centers, welded to roof supports at each seam. 12 ga. HRS steel roof with multiple layers of UL Listed fire resistant gypsum wall board lined on the interior with galvanealed steel sheets on interior. Assembly meets or exceeds UL 263 and ASTM-E119. Roof is sloped to facilitate runoff and door(s) are equipped with rain shields on exterior.
3. FLOOR SYSTEM: Grating and Leak Proof Spill-Containment Sump Assembly consisting of 1" deep welded galvanized steel floor grating over 6" deep leak proof secondary containment sump. Galvanized steel floor grating fabricated from welded steel grating with 1" tall x 3/16" thick bearing bars at 1" on center and crossbars at 4" on center. Sump floor is fabricated utilizing continuously welded 10 gauge steel sheets for maximum spill containment. Acrylic alkyd enamel coating is applied to secondary containment sump. Floor System is fabricated to comply with NAAMM MBG 531, "Metal Bar Grating Manual for Steel, Stainless Steel, and Aluminum Gratings and Stair Treads."
4. BUILDING BASE: Open channel construction, underside coated with corothan I-Coal Tar for maximum corrosion resistance. Forklift pockets and hold-down brackets for ease of off-loading and relocation. The building base is constructed in a manner to ensure the fork lifting, loading, transporting, offloading, and relocation do not affect this chemical storage building. This is to ensure the door openings remain square after lifting the building multiple times with a crane or fork trucks. The building base assembly shall consist of the following materials: 6 x 4 x 3/16" rectangular tubing, Hold Down Brackets welded to building are 1/2" thick plate steel angles, Floor Channel C 4x5.4, Floor Channel C6x8.2, and 4 x 2 x 1/8" rectangular tubing.
5. STATIC GROUNDING SYSTEM: Three (3) Interior grounding lugs, one (1) exterior static grounding connection and one (1) 10-foot long 5/8" diameter copper-clad steel grounding rod, and grounding lugs.
6. GRAVITY AIR FLOW VENTS: UL listed with minimum 1-1/2 hour rated fire dampers with UL listed 165 degree fusible links. Dampers include louvers and screens to provide airflow and have a galvanized steel frame and curtain type galvanized steel blades.
7. BUILDING FINISH: After an extensive cleaning process, the interior and exterior surfaces are protected with a high solids alkyd universal metal primer (primer) and a high solid acrylic alkyd enamel top coat providing proven resistance to exterior abrasion, corrosion, UV resistance and exceptional durability.
8. SIGNAGE: Permanent D.O.T. metal flip placard with rust proof aluminum holder and stainless steel clips on each building. One (1) pressure sensitive NFPA 704 Hazard Rating sign.
9. COLOR, POLYSILOXANE, BL BONE
 - a. HIGH SOLIDS, ISOCYANATE FREE POLY SILOXANE EPOXY COATING COMBINES THE PROPERTIES OF HIGH PERFORMANCE EPOXY AND POLYURETHANE IN ONE COAT.
10. DOOR 36 X 80 3HR RIGHT STD
 - a. SINGLE DOOR, 36" WIDE X 80" TALL, 3 HOUR FIRE RATED UL CLASSIFIED & LABELED, 3 HOUR FIRE-RATED 36"W X 80"H SINGLE DOOR. EQUIPPED WITH A UL LISTED DOOR CLOSER AND A UL LISTED EXTERIOR KEYED LOCK. DOOR SERVES AS A ENTRANCE AND EXIT DOOR.

11. FL2 PART WALL 5-7 2HR STD
 - a. INTERIOR SEPERATION WALL FOR FL2 MODELS (5' - 7' NOMINAL WIDTH). 2HR-FIRERATED WALL CONSTRUCTION, SEPERATION WALL EXTENDS FROM SUMP BASE TO CEILING.
12. PASSIVE AIR INLET W/VD
 - a. AIR INLET VENT TO PROVIDE NATURAL VENTILATION AND IS EQUIPPED WITH A FUSIBLE LINK FIRE DAMPER (3 HOUR) TO CLOSE IN THE EVENT OF A FIRE. VENT IS EQUIPPED WITH AN EXTERIOR LOUVER AND AN INTERIOR SCREEN TO PREVENT BIRD OR ANIMAL ENTRY. AN ADJUSTABLE REGISTER IS PROVIDED FOR MANUAL CONTROL OF AIR FLOW.
13. SHELVING 2 TIER SYSTEM
 - a. LINEAR FEET OF TWO TIERS OF SUMP SHELVING: ADJUSTABLE 16" LEAKPROOF STEEL SHELVING FORMED AND WELDED FROM HEAVY GAUGE STEEL WITH A 2" LIP AROUND THE ENTIRE SHELF. SHELVING LENGTHS ARE APPROXIMATE AND MAY VARY DUE TO SPACE LIMITATIONS. TOTAL PRICE IS CALCULATED FROM QUANTITY OF LINEAR FEET QUOTED. WEIGHT CAPACITY: 75 LBS. PER LINEAR FOOT. 8 LFT OF SHELVING PER ROOM.
14. FG T -BAR GRAT PSF REPL
 - a. PULTRUDED T-BAR FIBERGLASS FLOOR GRATING MADE WITH FIRE-RETARDANT VINYLESTER RESIN. IT IS CORRISION AND ULTRAVIOLET (UV) RESISTANT WITH A LOW FLAME SPREAD OF 25 OR LESS. 1-1/2" HEIGHT, 38% OPEN AREA FOR EASE OF FLOW SPILLS INTO SUMP. CORROSIVES ROOM ONLY.
15. DRY CHEM 45LB
 - a. UL, ULC LISTED AND FM APPROVED PRE-ENGINEERED DRY CHEMICAL FIRE SUPPRESSION SYSTEM FOR CLASS A,B AND C FIRES. EQUIPPED WITH MEANS FOR REMOTE ANNUNCIATION. SYSTEM INCLUDES FUSIBLE LINK DETECTION FOR AUTOMATIC ACTUATION, MANUAL PULL STATION, AND NOZZLE(S) FOR TOTAL FLOODING APPLICATION. AGENT STORAGE LOCATED ON BUILDING EXTERIOR IN WEATHERPROOF ENCLOSURE. AUDIBLE ALARM INCLUDED WITH SYSTEM. PROVIDE SYSTEMS COMPLETE WITH FULL TANK OF SUPPRESSANT.
 - 1) **NOTE - GENERAL CONTRACTOR RESPONSIBLE TO ARRANGE FOR SYSTEM TO BE ARMED BY AN INDEPENDENT, LICENSED TECHNICIAN AND ANY RESULTING TESTS OR OTHER MAINTENANCE.
16. RAMP ADJUSTABLE 48 X 96 HD
 - a. ACCESS RAMP (48"W X 96"L) ADJUSTABLE, FABRICATED FROM 1/8" DIAMOND PLATE STEEL. COLOR: SAFETY YELLOW. RATED FOR 100 LBS PER SQ FT AND 1,500 LBS POINT LOAD.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's written instructions.
- B. General Contractor shall be responsible for securing any required third party or local approvals necessary.
- C. General Contractor shall be responsible for arranging transportation of building, offloading, anchoring, arming dry chemical fire suppression, and electrical / water connections and/or permits.

3.02 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Nonconforming Work: shall be corrected in a timely manner at the contractors expense.

3.03 SYSTEM STARTUP

- A. Prepare and start equipment and systems in accordance with manufacturers' instructions and recommendations.

3.04 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

3.05 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals for additional submittals.
- B. Demonstrate proper operation of equipment to Owner's designated representative.

END OF SECTION 133501

**SECTION 142400
HYDRAULIC ELEVATORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Complete hydraulic elevator systems.
 - 1. Passenger type.
- B. Elevator Maintenance Contract.

1.02 RELATED REQUIREMENTS

- A. Section 042000 - Unit Masonry: Masonry hoistway enclosure; building-in and grouting hoistway door frames.
- B. Section 051200 - Structural Steel Framing: Includes overhead hoist beams.
- C. Section 078400 - Firestopping: Fire rated sealant in hoistway.
- D. Section 096500 - Resilient Flooring: Floor finish in car.
- E. Section 211300 - Fire-Suppression Sprinkler Systems: Sprinkler heads in hoistway.
- F. Section 260533.13 - Conduit for Electrical Systems:
- G. Section 260583 - Wiring Connections:
- H. Section 284600 - Fire Detection and Alarm:

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials Current Edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- C. AISC 360 - Specification for Structural Steel Buildings 2016 (Revised 2021).
- D. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test 2015 (Reaffirmed 2020).
- E. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices 2019, with Errata (2021).
- F. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators, Inclined Elevators, Limited-Use/Limited-Application Elevators, Private Residence Elevators, Escalators, Moving Walks, and Dumbwaiters 2020.
- G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.
- J. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.
- L. ITS (DIR) - Directory of Listed Products current edition.
- M. NEMA MG 1 - Motors and Generators 2018.
- N. NFPA 13 - Standard for the Installation of Sprinkler Systems Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- O. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

- P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.
- Q. PS 1 - Structural Plywood 2009 (Revised 2019).
- R. UL (DIR) - Online Certifications Directory Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate work with other installers to provide conduits necessary for installation of wiring including but not limited to:
 - a. Elevator equipment devices remote from elevator machine room or hoistway.
 - b. Elevator pit for lighting and sump pump.
 - 2. Coordinate work with other installers for equipment provisions necessary for proper elevator operation, including but not limited to, the following:
 - a. Automatic transfer switches with auxiliary contacts for emergency power transfer status indication.
 - b. Shunt trip devices for automatic disconnection of elevator power prior to fire suppression system activation.
 - c. Overcurrent protection devices selected to achieve required selective coordination.
- B. Preinstallation Meeting: Convene meeting at least one week prior to start of this work.
 - 1. Review schedule of installation, proper procedures and conditions, and coordination with related work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on following items:
 - 1. Signal and operating fixtures, operating panels, and indicators.
 - 2. Car design, dimensions, layout, and components.
 - 3. Car and hoistway door and frame details.
 - 4. Electrical characteristics and connection requirements.
- C. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
 - 1. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
 - 2. Hoistway Components: Size and location of car guide rails, buffers, jack unit and other components.
 - 3. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
 - 4. Clearances and over-travel of car.
 - 5. Locations in hoistway and machine room of traveling cables and connections for car lighting and telephone.
 - 6. Location and sizes of hoistway and car doors and frames.
 - 7. Electrical characteristics and connection requirements.
 - 8. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.
- D. Samples: Submit samples illustrating car interior finishes, car and hoistway door and frame finishes, and handrail material and finish in the form of cut sheets or finish color selection brochures.
- E. Testing Agency's Qualification Statement.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- G. Initial Maintenance Contract.
- H. Maintenance Contract: Submit proposal to Owner for standard one year continuing maintenance contract agreement in accordance with ASME A17.1 and requirements as

indicated, starting on date initial maintenance contract is scheduled to expire.

1. Indicate in proposal the services, obligations, conditions, and terms for agreement period and for renewal options.
- I. Operation and Maintenance Data:
1. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
 2. Operation and maintenance manual.
 3. Schematic drawings of equipment and hydraulic piping, and wiring diagrams of installed electrical equipment with list of corresponding symbols to identify markings on machine room and hoistway apparatus.

1.06 QUALITY ASSURANCE

- A. Maintain one copy of each quality standard document on site.
- B. Designer Qualifications: Design guide rails, brackets, anchors, and machine anchors under direct supervision of a licensed Professional Structural Engineer experienced in design of this type of work and licensed in Florida.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.
- D. Installer Qualifications: Trained personnel and supervisor on staff of elevator equipment manufacturer.
- E. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.
- F. Products Requiring Fire Resistance Rating: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
- G. Products Requiring Electrical Connection: Listed and classified by UL (DIR) or testing agency acceptable to authorities having jurisdiction as suitable for the purpose indicated in construction documents.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty for elevator operating equipment and devices for one year from Date of final acceptance by the General Contractor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design - Hydraulic Elevators: ThyssenKrupp Elevator; Endura MRL 5000H.
- B. Other Acceptable Manufacturers - Hydraulic Elevators:
 1. Otis Elevator Company; [____]: www.otis.com/#sle.
 2. Schindler Elevator Corporation; [____]: www.schindler.com/#sle.
- C. Substitutions: See Section 016000 - Product Requirements.
- D. Products other than Basis of Design are subject to compliance with specified requirements and prior approval of Architect. By using products other than Basis of Design, the Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.
- E. Source Limitations: Provide elevator and associated equipment and components produced by the same manufacturer as the other elevator equipment used for this project and obtained from a single supplier .

2.02 HYDRAULIC ELEVATORS

- A. Hydraulic Passenger Elevator, No. 1:
 1. Hydraulic Elevator Equipment:
 - a. Holeless hydraulic with cylinder mounted within hoistway.
 2. Drive System:

- a. Variable voltage variable frequency (VVVF) to modulate motor speed.
3. Operation Control Type:
4. Interior Car Height: 96 inch.
5. Electrical Power: 480 volts; alternating current (AC); three phase; 60 Hz.
6. Motor size: 50 HP
7. Rated Net Capacity: 5,000 lbs.
8. Rated Speed: 150 ft per minute.
9. Hoistway size: 11'-4 3/4" wide by 8'-2" Deep
10. Interior Cab Clear Dimensions: 8'-5 1/2" wide by 5'-8" deep.
11. Elevator Pit Depth: 48 inch.
12. Travel Distance: 18'-0".
13. Number of Stops: 2.
14. Number of Openings: 2 Front; 2 Rear.

2.03 COMPONENTS

- A. Elevator Equipment:
 1. Motors, Hydraulic Equipment, Controllers, Controls, Buttons, Wiring, Devices, and Indicators: Comply with NFPA 70. Refer to Section 260583
 2. Guide Rails, Cables, Buffers, Attachment Brackets and Anchors: Design criteria for components includes safety factors in accordance with applicable requirements of Elevator Code, ASME A17.1.
 3. Buffers:
 - a. Spring type for elevators with speed less than or equal to 200 feet per minute.
 4. Lubrication Equipment:
 - a. Provide grease fittings for periodic lubrication of bearings.
 - b. Grease Cups: Automatic feed type.
 - c. Lubrication Points: Visible and easily accessible.
- B. Electrical Equipment:
 1. Motors: NEMA MG 1.
 2. Boxes, Conduit, Wiring, and Devices: As required by NFPA 70. Refer to Sections 260533.13 and 260583.
 3. Spare Conductors: Provide ten percent in extra conductors and two pairs of shielded audio cables in traveling cables.
 4. Include wiring and connections to elevator devices remote from hoistway and between elevator machine room. Provide additional components and wiring to suit machine room layout. Refer to Section 260583.

2.04 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).
- B. Accessibility Requirements: Comply with ADA / Florida Accessibility Code Standards.
- C. Perform structural steel design, fabrication, and installation in accordance with AISC 360.
- D. Perform welding of steel in accordance with AWS D1.1/D1.1M.
- E. Fabricate and install door and frame assemblies in accordance with NFPA 80 and in compliance with requirements of authorities having jurisdiction.
- F. Perform electrical work in accordance with NFPA 70.
- G. Comply with venting or pressurization of hoistway design in accordance with HVAC system requirements and authorities having jurisdiction (AHJ).
- H. Comply with fire protection sprinkler system of hoistway design in accordance with NFPA 13 requirements and authorities having jurisdiction (AHJ). Refer to Section 211300.

2.05 OPERATION CONTROLS

- A. Elevator Controls: Provide landing operating panels.

1. Landing Operating Panels: Metallic type, one for originating "Up" and one for originating "Down" calls, one button only at terminating landings; with illuminating indicators.
 2. Comply with ADA Standards for elevator controls.
 3. Style: Basis of Design: TK - traditional.
- B. Terminate elevator control system with building security and fire alarm systems.
- C. Door Operation Controls:
1. Program door control to open doors automatically when car arrives at floor landing.
 2. Render "Door Close" button inoperative when car is standing at dispatch landing with doors open.
 3. Door Safety Devices: Moveable, retractable safety edges, quiet in operation; equipped with photo-electric light rays.

2.06 OPERATION CONTROL TYPE

- A. Single Automatic (Push Button) Operation Control: Applies to car in single elevator shaft.
1. Refer to description provided in ASME A17.1.
 2. Set system operation so that momentary pressure of landing button dispatches car from other landing to that landing.
 3. Allow call registered by momentary pressure of landing button at any time to remain registered until car stops in response to that landing call.
 4. If elevator car door is not opened within predetermined period of time after car has stopped at terminal landing allow car to respond to call registered from other landing.

2.07 EMERGENCY POWER

- A. Elevator Emergency Power Supply: Supplied by battery backup; provide elevator system components as required for emergency power characteristics.
- B. Emergency Lighting: Comply with ASME A17.1 elevator lighting requirements.
- C. Provide operational control circuitry for adapting the change from normal to emergency power.

2.08 MATERIALS

- A. Stainless Steel Sheet: ASTM A666, Type 441; No. 4 Brushed finish unless otherwise indicated.
- B. Extruded Aluminum: ASTM B221 (ASTM B221M), natural anodized finish unless otherwise indicated.
- C. Tempered Glass: 3/8 inch minimum thickness, fully tempered in compliance with ASME A17.1, 16 CFR 1201, ANSI Z97.1, and ASTM C1048 tempered glass requirements.

2.09 CAR AND HOISTWAY ENTRANCES

- A. Elevator, No. 1:
1. Car and Hoistway Entrances, Each Elevator Floor Lobby:
 - a. Framed Opening Finish and Material: Brushed stainless steel.
 - b. Car Door Material: To match hoistway entrance doors, with rigid sandwich panel construction.
 - c. Hoistway Door Material: To match cab entrance doors, with rigid sandwich panel construction.
 - d. Door Operation: Side opening, two speed.
 - e. Door Width: 54 inch.
 - f. Door Height: 84 inch.
 - g. Sills: Extruded aluminum.

2.10 CAR EQUIPMENT AND MATERIALS

- A. Elevator Car, No. 1:
1. Car Operating Panel: Provide main; flush-mounted applied face plate, with illuminated call buttons corresponding to floors served with "Door Open/Door Close" buttons, "Door Open" button, "Door Close" button, and alarm button.
 - a. Panel Material: Integral with front return; one per car.

- b. Car Floor Position Indicator: Above door with illuminating position indicators.
 - c. Locate alarm button where it is unlikely to be accidentally actuated; not more than 54 inch above car finished floor.
 2. Flooring: Resilient vinyl plank.
 3. Front Return Panel: Match material of car door.
 4. Door Wall: Stainless steel.
 5. Side Walls: Stainless steel.
 6. Rear Wall: Stainless steel.
 7. Hand Rail: Stainless steel, at all three sides. Provide open clearance space 1-1/2 inch (38 mm) wide to face of wall.
 - a. Round, Metal Tube: 1-1/2 inch diameter.
 - b. Stainless Steel Finish: No. 4 Brushed.
 8. Ceiling:
 - a. Canopy Ceiling: Style TK - Metal pan with downlights.
 - b. Panel Finish: No. 4 Brushed stainless steel.
 - c. Lighting: LED.
 9. Provide emergency access panel for egress from car at ceiling.
- B. Car Accessories:
 1. Certificate Frame: Stainless steel frame glazed with tempered glass, and attached with tamper-proof screws.
 2. Protective Pads: Canvas cover, padded with impact-resistant fill material, sewn with piping edges; fire resistant in compliance with ASME A17.1; brass grommets for supports, covering side and rear walls and front return, with cut-out for control panel; provide one set for each elevator.
 - a. Color: Manf. standard..
 - b. Provide at least 4 inch clearance from bottom of pad to finished floor.
 - c. Pad Supports: Stainless steel studs, and mounted from ceiling frame.

2.11 HOISTWAY ENTRANCES

- A. Hoistway Entrances:
 1. Framed Opening Material and Finish: Brushed stainless steel.
 2. Door Material and Finish: Brushed stainless steel.
 3. Sills: Extruded aluminum.
- B. Car Doors:
 1. Car Door Material and Finish: Brushed stainless steel.
 2. Sills: Extruded aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting this work.
- B. Verify that hoistway, pit, machine room, and [] are ready for work of this section.
- C. Verify hoistway shaft and openings are of correct size and within tolerance.
- D. Verify location and size of machine foundation and position of machine foundation bolts.
- E. Verify that electrical power is available and of correct characteristics.

3.02 PREPARATION

- A. Arrange for temporary electrical power for installation work and testing of elevator components, and comply with requirements of Section 015000 - Temporary Facilities and Controls.
- B. Maintain elevator pit excavation free of water.

3.03 INSTALLATION

- A. Coordinate this work with installation of hoistway wall construction.
- B. Install system components, and connect equipment to building utilities.

- C. Provide conduit, electrical boxes, wiring, and accessories. Refer to Sections 260533.13 and 260583.
- D. Install hydraulic piping between cylinder and pump unit.
- E. Mount machines, motors, and pumps on vibration and acoustic isolators, on bed plate and concrete pad.
 - 1. Securely fasten to building supports.
 - 2. Prevent lateral displacement.
- F. Install hoistway, elevator equipment, and components in accordance with approved shop drawings.
- G. Install guide rails to allow for thermal expansion and contraction movement of guide rails.
- H. Accurately machine and align guide rails, forming smooth joints with machined splice plates.
- I. Install hoistway door sills, frames, and headers in hoistway walls; grout sills in place, set hoistway floor entrances in alignment with car openings, and align plumb with hoistway.
- J. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.
- K. Wood Surfaces not Exposed to Public View: Finish with one coat primer; one coat enamel.
- L. Adjust equipment for smooth and quiet operation.

3.04 TOLERANCES

- A. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 and ASME A17.2.
- B. Car Movement on Aligned Guide Rails: Smooth movement, without any objectionable lateral or oscillating movement or vibration.

3.05 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Testing and inspection by regulatory agencies will be performed at their discretion.
 - 1. Schedule tests with agencies and notify Owner and Architect.
 - 2. Obtain permits as required to perform tests.
 - 3. Document regulatory agency tests and inspections in accordance with requirements.
 - 4. Perform tests required by regulatory agencies.
 - 5. Furnish test and approval certificates issued by authorities having jurisdiction.

3.06 ADJUSTING

- A. Adjust for smooth acceleration and deceleration of car to minimize passenger discomfort.
- B. Adjust with automatic floor leveling feature at each floor landing to reach 1/4 inch maximum from flush with sill.

3.07 CLEANING

- A. Remove protective coverings from finished surfaces.
- B. Clean surfaces and components in accordance with manufacturers written instructions.

3.08 CLOSEOUT ACTIVITIES

- A. Demonstrate proper operation of equipment to Owner's designated representative.
- B. Demonstration: Demonstrate operation of system to Owner's personnel.
 - 1. Use operation and maintenance data as reference during demonstration.
 - 2. Briefly describe function, operation, cleaning and maintenance of each component.
- C. Training: Train Owner's personnel on cleaning and operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.09 PROTECTION

- A. Do not permit construction traffic within car after cleaning.
- B. Protect installed products until Date of Substantial Completion.
- C. Touch-up, repair, or replace damaged products and materials prior to Date of Substantial Completion.

3.10 MAINTENANCE

- A. Provide Initial Maintenance Contract of elevator system and components in accordance with ASME A17.1 and requirements as indicated for 12 months from Date of final acceptance by the General Contract.
- B. Perform maintenance contract services using competent and qualified personnel under the supervision and direct employ of the elevator manufacturer or original installer.
- C. Maintenance contract services shall not be assigned or transferred to any agent or other entity without prior written consent of Owner.
- D. Include systematic examination, adjustment, and lubrication of elevator equipment.
- E. Maintain and repair or replace parts, whenever required, using parts produced by original equipment manufacturer.
- F. Perform work without removing cars from use during peak traffic periods.
- G. Provide emergency call back service during regular working hours throughout period of this maintenance contract.
- H. Maintain an adequate stock of parts for replacement or emergency purposes, and have personnel available to ensure the fulfillment of this maintenance contract without unreasonable loss of time.

END OF SECTION 142400